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DEPARTMENT OF COMMERCE

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SABLEFISH FISHERY OF THE EASTERN BERING SEA AND NORTHEASTERN PACIFIC

Preliminary Fishery Management Plan

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On the 4th of February, 1977, the Secretary of Commerce, through an appropriate delegation of authority to the Associate Administrator for Marine Resources of the National Oceanic and Atmospheric Administration and the Director of the National Marine Fisheries Service, published a Notice of Determination, Preparation, Issuance, and Implementation of Preliminary Fishery Management Plans at 42 FR 6873. In order that each Plan may have the widest possible circulation, the Secretary has decided that each should be published in the FEDERAL REGISTER.

Dated the 4th day of February, 1977 at Washington, D.C.

WINFRED H. MEIBOHM,
Associate Director, National Marine Fisheries Service.

PRELIMINARY FISHERY MANAGEMENT PLAN FOR SABLEFISH FISHERY OF THE EASTERN BERING SEA AND NORTHEASTERN PACIFIC

FEBRUARY 1977.

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1.0 INTRODUCTION

The sablefish, or blackcod, (*Anoplopoma fimbria*), has been exploited by U.S. and Canadian fishermen for almost a century. The species, which inhabits the continental shelf and slope waters throughout most of the northeastern Pacific, has been pursued by trawl and longline fishermen and, most recently, by the deployment of pots on longlines. Foreign fishing operations were initiated by Japan in the Bering Sea in 1954. These gradually expanded from the Bering Sea to off central California and eventually included vessels of the U.S.S.R., Republic of Korea, Taiwan, Poland, East Germany, and West Germany. The foreign fisheries have come into direct conflict with U.S. and Canadian fishermen in terms of the competition for the fishery resources. Over the last decade, there has been evidence of overfishing of certain portions of the stocks and the need for a comprehensive, conservation program. This Preliminary Management Plan is in direct response to the legislative requirements mandated by P.L. 94-265.

2.0 PRELIMINARY DESCRIPTION OF THE FISHERY

A. AREAS AND STOCK INVOLVED

The geographic distribution of sablefish is very broad—from off Mexico extending northward along the entire Pacific Coast of the U.S. and Canada, westward along the Aleutian Island chain and the continental edge in the Bering Sea, along the Siberian and Kamchatkan coasts, and down to the northeastern coast of Japan (Figure 1).

It is evident from tagging studies conducted by Japan, the United States, and the Republic of Korea that some sablefish conduct extensive migrations (Sasaki et al., footnote 1). Interchange of fish between the Bering Sea, the Gulf of Alaska and off the Pacific Northwest apparently takes place. There is some evidence that sablefish stocks from the State of Washington to the Bering Sea may be interrelated. However, Low (footfote 2) reported that the inter-area exchange of sablefish is slow and that the majority of these fish do not migrate over great distances. Inasmuch as sablefish are relatively resident to particular areas, the stock can be divided into four regions—the Bering Sea, the Aleutian Region, the Gulf of Alaska, and Washington-California—for the purposes of considering management measures.

Tht present fishery extends along the continental slope of the Bering Sea along both sides of the Aleutian Islands, throughout the Gulf of Alaska and southwards to southern California.

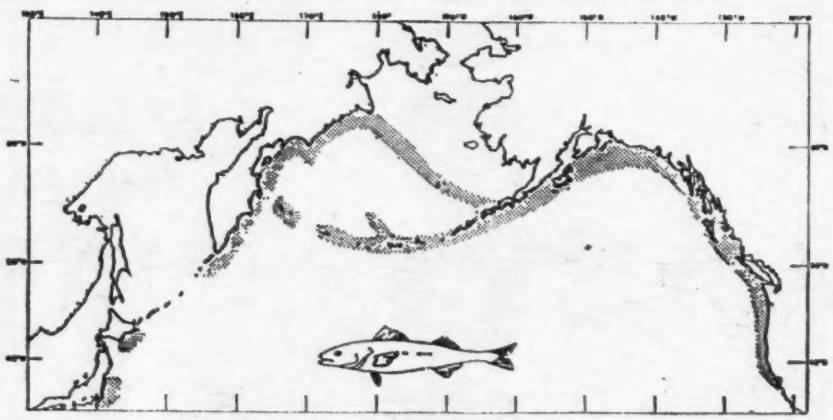


Figure 1.--Geographic distribution of adult sablefish, (Kodolov 1968).

The resource in recent years (1970–74) has been exploited directly by six countries: Japan, the U.S., Canada, the U.S.S.R., the R.O.K., and the R.O.C—in approximate decreasing order of landings Three other countries—the Polish People's Republic (P.P.R.), the Federal Republic of Germany (F.R.G.), and the German Democratic Republic (G.D.R.)—also conduct fishing operations in the northeastern Pacific, but sablefish are only landed incidentally.

B. HISTORY OF EXPLOITATION

For nearly a century, the sablefish fishery was exclusively conducted by North Americans, but since 1961 it has been dominated by Japan.

Up to 1957 the sablefish fishery was located in the northeastern Pacific Ocean (Gulf of Alaska to California) (Figure 2). Average annual catch ranged from 2,000 to 9,500 mt. With the commencement of fishing by other nations, the total catch increased to 30,000 mt. in 1961, 40,000 mt. in 1968, and reached an all-time high of 65,000 mt. in 1972 (Table 1).

The sharp increase in total catch during 1961–67 can be attributed to the growth of Japanese fishing in the Bering Sea-Aleutian Region. The all-nation catch, after an initial surge of 18,400 to 28,500 mt. during 1961–63, has fluctuated between 7,500 mt. (in 1974) and 20,500 mt. (in 1968) (Figure 2). The highest catch on record for the Bering Sea-Aleutian Region occurred in 1962 when 28,500 mt. were taken by Japan (Table 1). Catches declined to 8,600 mt. in 1965, increased to a second peak of 20,500 mt. in 1968 (16,250 mt. by Japan and 4,250 mt. by U.S.S.R.), and declined almost continuously thereafter. In the Bering Sea-Aleutian Region in 1974, Japan continued to account for almost all the sablefish caught. The U.S.S.R. took about 1 percent of the all-nation catch of 7,500 mt. that year.

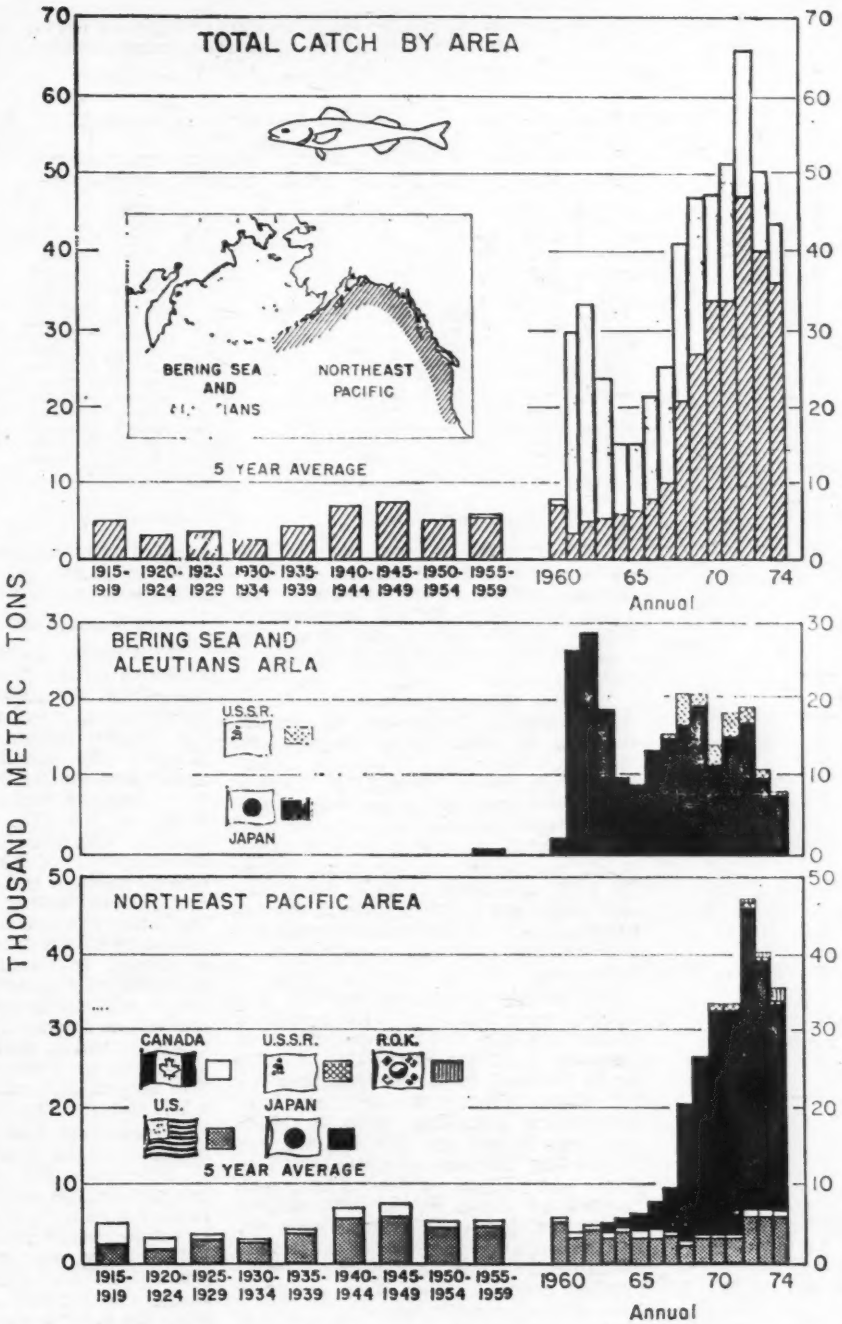


Figure 2. --Sablefish catch by area and country, 1915 to 1974. (Source: Low et al. 1976, footnote 3).

Table 1.--Sablefish landings in metric tons by nation in the Bering Sea and Aleutians and the northeastern Pacific Ocean, 1958-74.

Year	Northeastern Pacific Ocean						Bering Sea & Aleutians			Grand Total
	United States	Canada	Japan	USSR	Republic of Korea	Sub-Total	Japan	USSR	Sub-Total	
1958	2,586	383				2,969	32		32	3,001
1959	3,989	362				4,351	393		393	4,744
1960	5,136	705				5,841	1,861		1,861	7,702
1961	3,040	306				3,346	26,182		26,182	29,528
1962	4,017	428				4,445	28,521		28,521	32,966
1963	2,932	396	1,681			5,009	18,404		18,404	23,413
1964	3,659	637	1,041			5,337	9,237		9,237	14,574
1965	3,304	649	2,107			6,060	8,600		8,600	14,660
1966	3,142	970	3,527			7,639	13,088		13,088	20,727
1967	3,208	591	5,778			9,577	14,840	274	15,114	24,691
1968	2,027	577	17,571			20,175	18,258	4,256	20,514	40,689
1969	2,762	391	23,041			26,194	18,813	1,579	20,392	46,586
1970	2,935	327	28,841	980		33,083	10,904	2,874	13,778	46,862
1971	2,683	327	29,296	762		33,068	14,981	3,000	17,981	51,049
1972	5,530	1,103	38,713	834	308	46,488	16,538	2,406	18,944	65,432
1973	5,608	965	32,521	236	58	39,388	9,270	1,254	10,524	49,912
1974	6,982	503	26,594	202	2,500	36,781	7,409	91	7,500	44,281

SOURCE OF INFORMATION: Low et al. 1976 (footnote 3).

The dramatic increase in the all-nation catch from all regions combined during 1968-74 is attributable to the Japanese fishery in the northeastern Pacific Ocean, where her catch has ranged between 17,600 mt and 38,700 mt (Table 1).

Between 1968 and 1974 in the northeastern Pacific, Japan took the largest share of the total catch (84 percent), followed by the U.S. (12 percent); Canada (2 percent); the U.S.S.R. (1 percent); and the R.O.K. (less than 1 percent). However, the R.O.K. increased her sablefish fleet with a 1976 target catch considerably higher than before. (In 1975, and again in 1976, the R.O.C. sent longliners to participate in the sablefish fishery off the Pacific Northwest. The longline catch by these vessels is unknown.)

The sablefish catch by the U.S. and Canada from 1958 to 1971 has remained relatively stable and averaged 3,700 mt annually (3,200 mt by the U.S. and 500 mt by Canada) in the northeastern Pacific Ocean (Figure 2). Landings have increased to more than 7,000 mt (1974) and even higher by 1976 because the fishery has become more important as prices and market conditions improved. Catches by Japan in the northeastern Pacific dropped to less than 26,600 mt in 1974 from a peak of 38,800 mt in 1972 as Japanese domestic regulations were applied. Soviet catches have generally been less than 1,000 mt.

The all-nation catch in the northeastern Pacific Ocean shows a general building of the fishery from 1958 to 1967, a more than 2-fold increase from 1967 to 1968 (9,600 to 20,200 mt), a peak of 46,500 mt in 1972, and a decline thereafter (Table 1).

The total northeastern Pacific Ocean and Bering Sea catch of sablefish increased from approximately 3,000 mt in 1958 to 65,000 mt in 1972 and then dropped to less than 45,000 mt in 1974.

C. VESSELS AND GEAR EMPLOYED

(1) *Vessels.* Fishing vessels of the sablefish fishery generally fall into four categories: (1) trawlers of all countries, consisting of stern, side, and pair types; (2) Danish seiners of Japan and the R.O.K.; (3) longline-type vessels of Japan and the R.O.K., respectively; and (4) longline-trawl-trap combination vessel of the U.S. and Canada (Figure 3). Sablefish are generally incidental catches of the first two vessel categories trawlers and Danish seiners) but a target species (in varying degrees) of the latter two and some large Japanese independent stern trawlers in the Gulf of Alaska. In addition, support vessels in the form of factory ships (or motherships) and refrigerator transport ships service the smaller fishing vessels of the U.S.S.R., Japan, and the R.O.K. Information on the relative sizes and production aspects of fishing and support vessels is also presented in Figure 3.

U.S. and Canadian fishing vessels range in size from the small (15 to 38 m, or 49 to 120 feet long) trawlers and longliners of the U.S. and Canada to the large factory-type stern trawlers (up to 130 m, or 426 feet long) of other countries. This difference in size is primarily an influence of the proximity of fishing grounds to landing ports and logistics. With the notable exception of the high-seas tuna fleet of the U.S., most of the vessels of the U.S. and Canada on the Pacific Coast fish, ice or chill their catch, and return to landing ports within a week. In contrast, the other countries conduct a distant water operation, relying on mothership fleets or independent-type vessels capable of fishing, processing, and holding the products.

Vessel type	Comparative size	Length (Range) (meter)	Gross Tonnage (Range) (metric ton)	Country	Production aspect
Support:					
Factory Ship		152-183 m	12,000-23,000	U.S.S.R. Japan R.O.K.	Receives and processes catch from fishing vessels. Holding capacity of 10,000 tons of processed fish.
Refrigerated Transport Ship		73-137 m	1,700-25,000	U.S.S.R. Japan Poland	Holding only, or also processing capability. Holding capacity of 1,800 to 7,250 tons of processed fish.
Fishing:					
Stern Trawler		51-129 m	350-4,700	U.S.S.R. Japan R.O.K. Poland R.O.C.	Variable capabilities: from wet fish only to processing and holding. Holding capacity of 200 to 900 tons of processed fish.
Side Trawler		38-74 m	230-1,472	U.S.S.R. Japan	Variable capabilities: from wet fish only to chilling/processing, and holding. Holding capacity of 50 to 100 tons of fish or products
Side Trawler		15-31 m	18-82	U.S. Canada	Wet fish and/or chilling capability. Holding capacity of 20 to 40 tons of fish.
Pair Trawler		±45 m	135-300	Japan R.O.K.	Wet fish only. Catch is transferred to mothership. Holding capacity of 40 to 60 tons of fish.
Danish Seiner		27-30 m	96-125	Japan	Wet fish only. Catch is transferred to mothership. Holding capacity of 40 tons of fish.
Longliner/ Gillnetter/ Trap Combination		30-60 m	400-500	Japan R.O.K.	Processing and freezing capability. Holding capacity of 60-100 tons of frozen fish.
Longliner/ Trawler/Trap Combination		15-38 m	27-50	U.S. Canada	Wet fish and/or chilling capability. Holding capacity of 75 tons of fish.

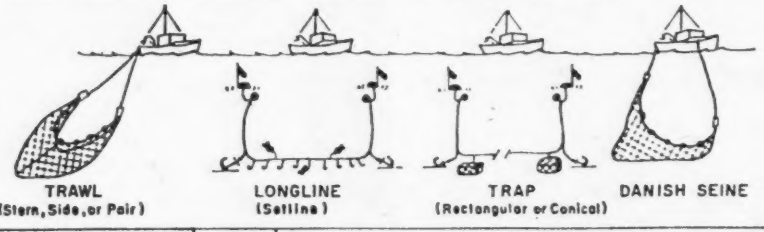
Figure 3.—General characteristics of vessels associated with the sablefish fishery. (Developed from: Chitwood 1969, Sundstrom 1957, and U.S. Coast Guard, footnote 4). Changes continued to occur in vessel designs, characteristics, and sizes; the upper size range and capacity have probably increased.

For the most part, the relatively smaller stern trawlers; side or pair trawlers of the U.S.S.R., Japan, and the R.O.K.; and the Danish seiners of Japan are accompanying factory ships. The independent trawlers and longline-other combination vessels either unload their products onto a transport vessel or return to home port with their loads.

Over the years, the trend by foreign countries other than Canada has generally been toward larger factory-type trawlers and line vessels. In the U.S. and Canada, the trend has been toward larger vessels, with capabilities of operating in several fisheries.

(2) *Gear.* The major fishing gear used to exploit sablefish includes trawls, Danish seines, longlines (setlines), and traps (pots) (Figure 4). Trawls and Danish seines operate on the principle of herding, while longlines and traps operate on the principle of attracting. In the U.S. and Canada, most sablefish are taken with trawl, longline, and traps.

In the Bering Sea-Aleutian Region the gear types fished are the trawls (by all foreign countries other than Canada), Danish seines (by Japan and R.O.K.), and longlines (by Japan). Gears now used in the northeastern Pacific Ocean are trawls (all countries except R.O.C.), longlines (by U.S., Canada, Japan, R.O.K., and R.O.C.), and traps (by U.S., Canada, and R.O.K.).



AREA and GEAR	Sablefish Catch	BY COUNTRY								
		U.S.	Canada	Japan	U.S.S.R.	R.O.K.	P.R.	R.O.C.	F.R.G.	G.D.R.
Bering Sea & Aleutians										
TRAWL	Incidental			■	■	■	■	■		
DANISH SEINE	Incidental			■		■				
LONGLINE	Target			■						
Northeast Pacific										
TRAWL	Incidental*	■	■	■	■	■	■	■	■	■
LONGLINE	Target	■	■	■		■				
TRAP	Target	■	■			■				

Figure 4.--Major fishing gears currently associated with the sablefish fishery in the Bering Sea and northeastern Pacific Ocean. (Developed from INPFC reports, see footnote 5). (* Occasional target.)

The sablefish trap is a recent innovation, seeing increased usage by fishermen of the U.S., Canada, and the R.O.K. The trap was jointly developed by commercial fishermen and by scientists at the Northwest Fisheries Center, NMFS, and an outgrowth of fish trapping experiments initially directed at other species. The species-specific (sablefish) nature of the trap, the quality of fish captured, and other advantages not found in existing methods led to its development and use in the sablefish fishery (Hughes et al. 1970, High 1971, Parks 1973, Webb and Lockner 1973). The trap has evolved into a collapsible rectangular design in the U.S. and Canadian fishery, whereas that used by the R.O.K. is of collapsible conical design.

D. IMPACT OF FOREIGN FISHERY ON DOMESTIC FISHERY ACTIVITIES

The impact of foreign fishing activities (other than Canadian) on the U.S. sablefish fishery is examined in terms of (1) competition for sablefish stocks, (2) gear conflicts, (3) non-target species mortalities, and (4) implied economic consequences.

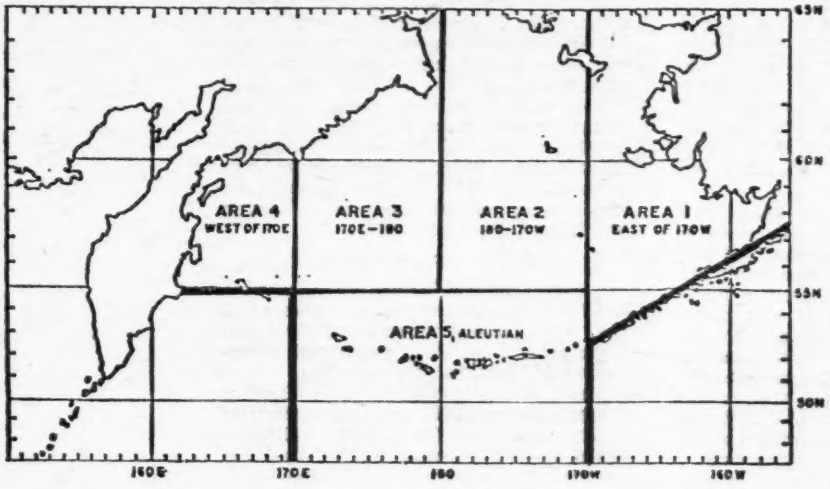
At present, the U.S. sablefish fishing grounds are located mainly in inside waters of southeastern Alaska and along the coasts of Washington, Oregon (especially off Astoria and Newport), and California (especially off Eureka, Fort Bragg, San Francisco, and Monterey). Fishing gears employed are traps, longlines, and trawls. Through the 1950's, landings of sablefish in the States of Alaska and Washington typically exceeded the landings in California. After the early 1960's there has been a reversal in this historical pattern with landings in California now being considerably larger than in Alaska or Washington.

Most of the foreign fisheries on sablefish are located in the Bering Sea, along the Aleutian Islands, and along the entire Gulf of Alaska from the Shumagins to southeastern Alaska (Figure 5). The major Japanese sablefish fishery is lo-

cated in those areas. The foreign fishing for sablefish was relatively minor off Washington, Oregon, and California until 1974. Since then, however, the R.O.K. has greatly expanded its sablefish operations and, furthermore, a small Taiwanese longline fishery has also begun there. These fisheries directly compete with U.S. coastal sablefish fishermen.

Overall, the impact of foreign fishing activities appears to be greatest and most critical in the area from southeastern Alaska to California.

(1) *Competition for Stocks.*—Since the U.S. does not have a sablefish fishery in the Bering Sea and the Aleutian Region, there is no competition for stocks there at this time.



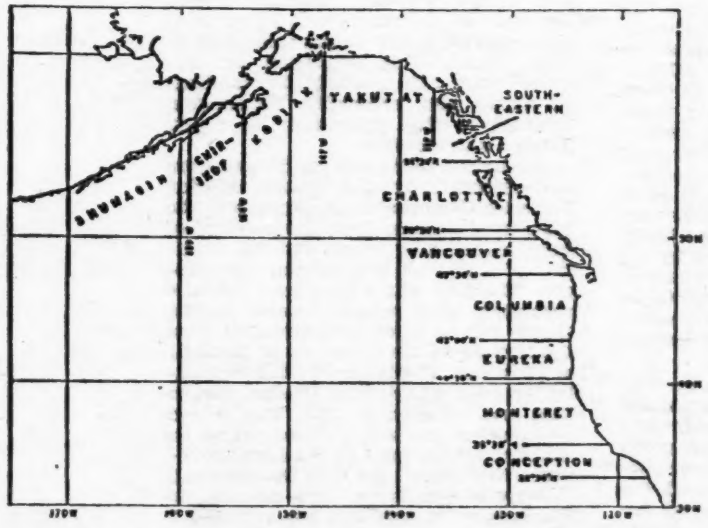


Figure 5.--Map of the North Pacific showing INPFC statistical areas.

In the Gulf of Alaska, the U.S. sablefish catch varied between 300 to 1,400 mt from 1964 to 1974 and is not expected to exceed 1,000 mt in 1976. Most of this catch is from southeastern Alaska (known as the INPFC Southeast Area). This compares to foreign catches exceeding 25,000 mt per year in the entire Gulf of Alaska; of which about 7,000 mt is taken off the Southeast Area. The foreign fishery in the Southeast Area is conducted on the continental slope (beyond the 12-mile contiguous fishery zone of the U.S.) whereas that by the U.S. is largely conducted in inside waters or in near coastal areas. Although fishing areas are different, the resource fished is presumed to be the same stock. This conclusion is supported by data on (1) inshore-offshore migrations of sablefish and (2) the recovery of sablefish with Japanese or South Korean fish hooks in their mouths in inside waters of the Southeast Area. Therefore, some competition for sablefish of the same stock between U.S. and foreign fishermen exists in the Southeast Area. As the U.S. sablefish effort has been relatively small, the competition has not been great; but declining stock abundance may, in the future, influence the U.S. sablefish industry.

In the Washington-California region, competition is more acute because foreign (especially R.O.K.) and U.S. fishermen often fish for sablefish in the same area and on the same stock.

(2) *Gear Conflicts.* The U.S. does not have a sablefish fishery in the Bering Sea and Aleutian Region. The U.S., however, has halibut and crab fisheries in the eastern Bering Sea and these have experienced gear conflicts with foreign fisheries.

As indicated in the previous section on Competition for Stocks, the U.S. sablefish fishery in the Gulf of Alaska is confined largely to the Southeast Area and on fishing grounds different from those of foreign sablefish fisheries. Therefore, direct gear conflicts between the fisheries are not large. In the Gulf of Alaska as a whole, however, there are U.S. fisheries for halibut, king crab, and snow crab—and these may well be experiencing gear and area-use conflicts with the foreign sablefish fisheries.

Gear conflicts are most acute in the Washington-California area. The greatest problem is with the damage to or loss of U.S. sablefish setline and trap gears due to foreign trawling activities. Futhermore, with the recent expansion of the R.O.K. longline/trap fishery, foreign longliners are also reported as being responsible for the loss of U.S. sablefish traps (footnote 6). In light of the increased usage of sablefish traps by U.S. fishermen (traps accounting for as much as 30 percent of the most recent U.S. sablefish landings), these gear conflicts are considered serious.

Sablefish are also taken by trawl gear in the U.S. fishery. The conflict between U.S. trawl gear (for sablefish) and foreign fishing gear is minimal, however, as U.S. trawls operate closer to shore and away from areas frequented by foreign fisheries.

(3) *Non-Target Species Mortalities.* The impact of foreign fishing activities here is examined in terms of (1) the impact of foreign sablefish fisheries on other (non-target) species and, conversely, (2) the impact of other foreign fisheries on sablefish (as the non-target species).

In the Bering Sea, about 75 percent of the sablefish caught are by trawl gear and the rest by longline gear. Most of the sablefish taken by trawl gear are taken incidental to the more intensive pollock and Pacific ocean perch fisheries. There are actually very few trawlers that fish specifically for sablefish. Some trawlers of the Japanese landbased dragnet fishery (which are of smaller sizes than

those of the mothership and independent trawl fisheries) would prefer to fish for sablefish, but this fishery is confined to the west of longitude 170°W by Japanese regulation. Therefore, the impact of this fishery on small halibut is minimized. For the rest of the trawl fishery, it is not so much the problem that trawling for sablefish may cause excessive mortalities on non-target species, but rather that trawling for other species (pollock and ocean perch) may cause excessive mortalities for sablefish. The longline fishery for sablefish in the Bering Sea is rather small by comparison to the entire Bering Sea fisheries, and mortalities of non-target species due to longlining activities for sablefish are generally not a problem.

In the Aleutian Region, trawl and longline gears account for about equal proportions of sablefish landed. The only other major species of commercial importance is the Pacific ocean perch—which is at a low level of abundance because of earlier overfishing. Therefore, trawling activities for sablefish may cause added mortalities on ocean perch. Added mortalities on other species due to longlining activities in the Aleutian Region are probably a minor problem since few are taken on longline gear.

In the Gulf of Alaska, almost 65 percent of the sablefish are caught by longline gear, 28 percent by trawls, and the rest by traps. Since the Gulf of Alaska is an important Pacific halibut area for U.S. fishermen who take halibut only by longline gear, Japanese longlining activities for sablefish could induce "a hooking mortality" on halibut. The magnitude of the apparent problem, however, is not well known. The size of the hooks used in sablefish longlines is much smaller than that used in the halibut fishery and the gangion line is lighter. Apparently, adult halibut hooked by sablefish longlines are not retained by the gear but the hooks that become lodged or swallowed by the halibut may induce a mortality factor. Juvenile halibut are generally not taken by sablefish longlines because the sablefish fishery operates in depths beyond their general depth distribution.

Foreign trawlers operating in the Gulf of Alaska for sablefish also cause added mortalities on commercially important species such as halibut and ocean perch but this is probably minimal because purposeful trawling activities are small. On the other hand, purposeful trawling activities for Pacific Ocean perch, flounders, and pollock will result in incidental catches of sablefish and impact on the sablefish resource.

In the Washington-California area, the R.O.K. is the only foreign country that has a substantial fishery for sablefish. This is largely a longline/trap fishery which does not create much of a problem with non-target species mortalities. It is, however, a problem in the areas of gear conflict and stock depletion.

(4) Implied Economic Consequences. Perhaps the most direct and serious economic impact of foreign fishing activities on U.S. sablefish fisheries is the gear damage and loss problem, especially off Washington-California where the R.O.K. has expanded its sablefish fishery. Coupled with the declining catch rates of sablefish along Washington-California of recent years (1974–76), some U.S. sablefish trap fishermen have been discouraged and forced by economics to revert to other fisheries, such as salmon trolling (footnote 6).

Another economic factor that may influence the U.S. sablefish fishery is imports. The U.S. currently imports approximately 200 mt (440,000 lbs) of sablefish annually (406,000 lbs from Japan and 34,000 lbs from Canada). What impact these imports may have on the supply and demand situation at the fishermen level, processor level, etc., is not known. However, the imports are small when compared to the U.S. catch of almost 7,000 mt in 1974.

E. HISTORY OF MANAGEMENT

Although sablefish have been exploited by North Americans for over a century, they have largely not come under direct management. In 1937 when the International Fisheries Commission (name changed to International Pacific Halibut Commission in 1953) imposed incidental catch regulation for Pacific halibut—based upon a ratio of halibut-to-other species, the sablefish catch was indirectly affected by the regulation (Crutchfield and Zellner 1962). At that time, the amounts of halibut sole could not exceed 1 pound (dressed weight, head off) of halibut to each 7 pounds of other species, not including salmon (and, later, tuna). This regulation was removed after 1966 and sablefish landings in Alaska and, especially, Washington declined as the opportunity to retain halibut was removed.

During the 1950's two regulations were recommended by the Pacific Marine Fisheries Commission in response to the industry's concern over the capture of small sablefish by trawls and the condition of stocks off Washington and Oregon. The first was a minimum fish-size regulation of 3 pounds dressed weight (heads off) or a length (measured from the first dorsal fin to the tip of the tail) of 17 inches. The latter (17 inches regulation) was adopted in Washington in 1955 and removed in 1971. The second recommendation was a closed season on sablefish off Oregon and Washington between November 1 through December 31. This recommendation was adopted in Washington in 1956 but was removed 2 years later following the Commission's recommendation that it be abolished. (DiDonato, footnote 7).

Major restrictions on the sablefish fishery came into effect in 1975 and 1976 after the resource was intensively fished by foreign countries (other than Canada), particularly Japan. They are in the form of direct and indirect catch quotas, vessel and gear limitations, and area-time closures on foreign fisheries as summarized in Table 2.

(1) *Character of Restrictions.* a. *Quotas.*—Under the terms of the current U.S.-Japan bilateral agreement, the following fishery restrictions pertain to sablefish in 1975 and 1976:

Bering Sea. Total catch of species other than walleye pollock and including sablefish, not to exceed 195,000 mt per year.

Aleutian region. Total catch of sablefish by the longline fishery not to exceed 1,200 mt per year. Total catch of all species, including sablefish by the landbased dragnet fishery, not to exceed 8,500 mt per year.

Northeastern Pacific Ocean. Total catch of sablefish by the North Pacific trawl fishery not to exceed 5,000 mt per year. Total catch of sablefish by the North Pacific longline fishery not to exceed 25,000 mt per year (number of longline vessels limited to 22). Of this total, a limit of 250 mt per year is imposed south of 48°30'N.

Table 2.--Current status of management over the sablefish fishery, 1976.

Country/ state	Area/fishery	Sablefish fishery prohibited	Type of restriction							
			Quota on sablefish		Vessel	Gear	Closures		Biological	
			Direct	Indirect			Area	Time	Size	Others
United States Agreement with:										
Japan	Bering Sea:	*								
	Longline	—	—	XXX	—	—	XXX	XXX	—	—
	Trawl	—	—	XXX	—	—	—	—	—	—
	Aleutian:									
	Longline	—	XXX	—	—	—	XXX	XXX	—	—
	Trawl	—	—	XXX	—	—	XXX	XXX	—	—
	N.E. Pacific:									
	Longline	—	XXX	—	XXX	—	XXX	XXX	—	—
	Trawl	—	XXX	—	XXX	—	XXX	XXX	—	—
U.S.S.R.	Bering Sea	—	—	XXX	—	—	XXX	XXX	—	—
	Aleutian	—	—	XXX	—	—	XXX	XXX	—	—
	Shumagin-S.E. Alaska	—	—	XXX	—	—	XXX	XXX	—	—
	32°30'N-47°45'N	—	—	XXX	—	—	XXX	XXX	—	—
R.O.K.	Bering Sea	—	—	—	—	—	—	—	—	—
	Aleutians	—	—	—	—	—	—	—	—	—
	N.E. Pacific	—	—	—	—	—	—	—	—	—
Poland	Bering Sea	No fishing	—	—	—	—	—	—	—	—
	Aleutian	—	—	—	—	—	XXX	XXX	—	—
	N.E. Pacific	XXX	—	—	XXX	—	XXX	XXX	—	—
R.O.C.	All areas	—	—	—	—	—	—	—	—	—
E. Germany	All areas	—	—	—	—	—	—	—	—	—
W. Germany	All areas	—	—	—	—	—	—	—	—	—
Domestic Regulations by:										
Alaska	Off Alaska	—	XXX	—	—	XXX	XXX	XXX	—	—
Washington	Off Washington	—	—	—	—	—	—	—	—	—
Oregon	Off Oregon	—	—	—	—	—	—	—	—	—
California	Off California	—	—	—	—	—	—	—	—	—
Canada	Off Canada	—	—	—	—	—	—	—	XXX	—

* A dash (—) designates that regulation does not apply.
(XXX) designates that regulation applies.

Under the terms of the U.S.-U.S.S.R. bilateral agreement for 1975 and 1976, the catching of sablefish is indirectly covered under the limitations on catches of "other species"—120,000 mt in the eastern Bering Sea; 16,000 mt in the Aleutian Region; 30,000 mt in the Shumagin-Southeastern Region; and 3,000 mt from 32°30'N to 47°45'N.

The Polish People's Republic is restricted from developing a specialized fishery for sablefish in the northeastern Pacific in 1975 and 1976 by bilateral agreement with the United States.

The State of Alaska has a 454 mt (1 million lb) limit for its sablefish fishery in certain districts of the southeastern Alaska region (Alaska Department of Fish and Game, 1976). No further catch limit restrictions apply to sablefish, including those of other countries.

With regard to size limit, Canada has a 2½ pound minimum-weight limit for sablefish landed in British Columbia.

b. *Vessel-Gear Limitations.*—Under terms of the U.S.-Japan bilateral agreement for 1975 and 1976, the number of longline vessels operating in the northeastern Pacific Ocean is limited to 22. There are no other vessel limitations for any country, as far as the sablefish fishery is concerned.

For the State of Alaska, sablefish may only be taken by longlines and traps. Those taken incidentally by longlines may be retained in an amount not to exceed 20 percent, by weight, of each halibut landing.

c. *Area-Time Closures.*—Under terms of bilateral fisheries agreements in effect with Japan, the U.S.S.R., and the Polish People's Republic, certain area-time closures and gear operations are described in Figures 6 to 13 for the Bering Sea, the Aleutian Region, and the northeastern Pacific Ocean. These area-time closures are imposed primarily to protect Pacific halibut and crabs and to reduce gear conflict with U.S. fishermen. However, they offer some protection to the sablefish resource as well.

For the domestic fishery, area-time closures exist in Southeastern Alaska. These restrictions are socio-economic (a September 1st opening of northern Southeastern coincides with the closure of halibut longlining and provides a secondary income for halibut longliners) and bio-economic (a June 15 through November 15 fishery was originally designed to protect sablefish while in spawning conditions and was later expanded to preclude fishing from April 1 to June 15 when fish are not in as good a condition as in other times).

(2) *Purpose of Restrictions.* Some of the main purposes for imposing catch quotas, vessel and gear limitations, and area-time closures are to reduce gear conflicts between user groups, to protect U.S. fishermen from intense competition with foreign fishermen, to protect fish stocks from overexploitation, and to rebuild overexploited stocks.

a. *To Reduce Gear Conflicts and Protect U.S. Fishermen.*—Many of the area-time closures are imposed to reduce gear conflicts of foreign trawl gear with U.S. set gear and to protect U.S. fishermen from excess competition, especially in the Pacific halibut fishery.

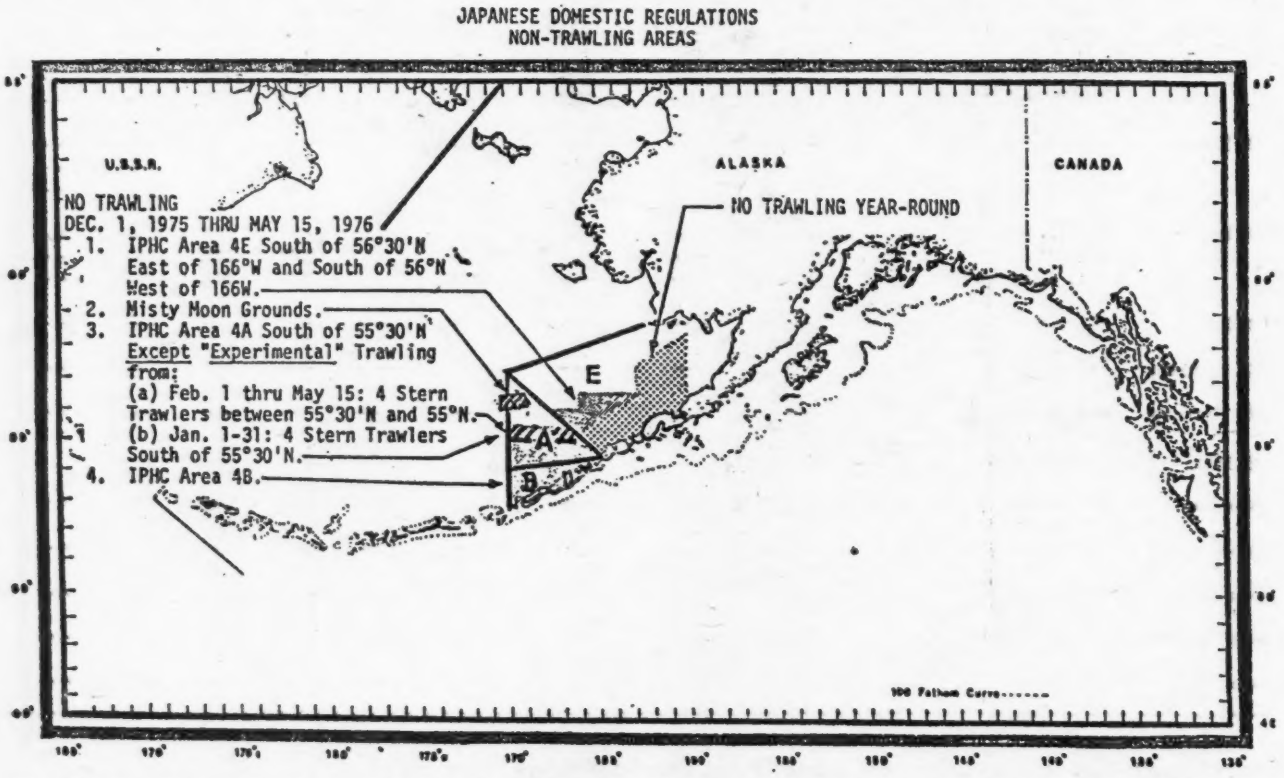
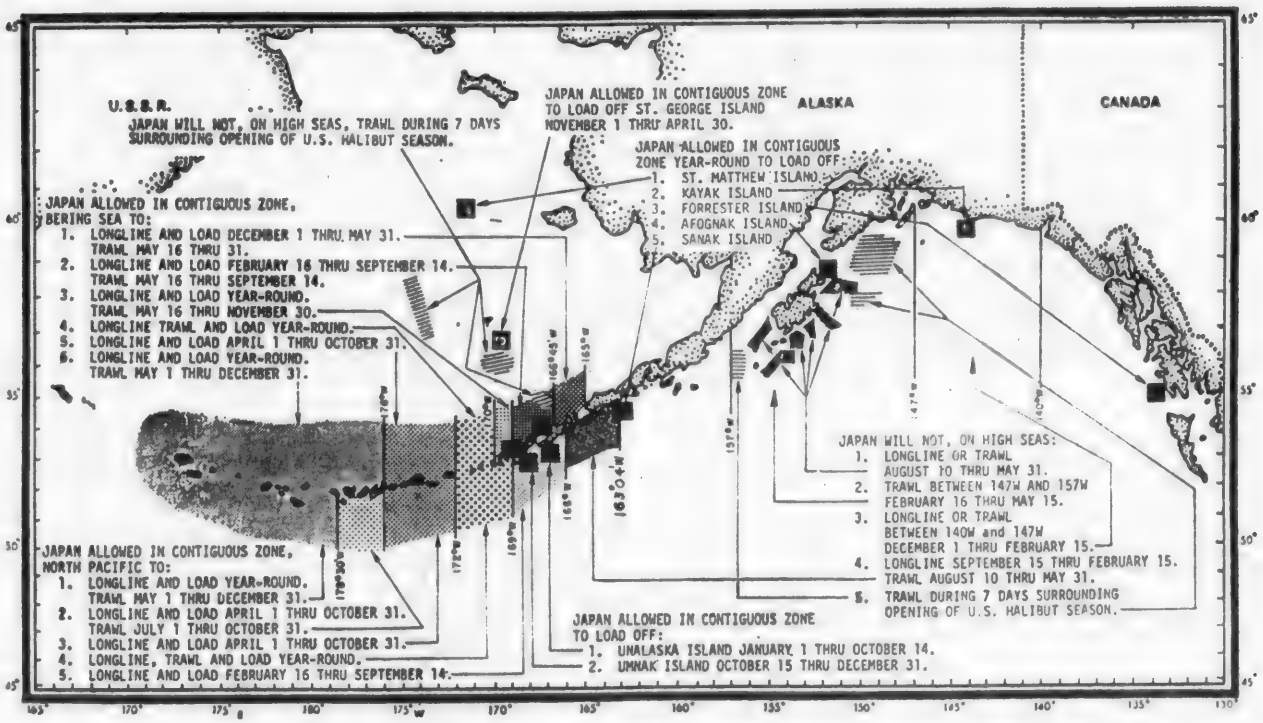

JAPANESE DOMESTIC REGULATIONS
NON-TRAWLING AREAS
U.S.S.R.
ALASKA
CANADA
NO TRAWLING YEAR-ROUND
NO TRAWLING
DEC. 1, 1975 THRU MAY 15, 1976
1. IPHC Area 4E South of 56°30'N East of 166°W and South of 56°N West of 166W.
2. Misty Moon Grounds.
3. IPHC Area 4A South of 55°30'N Except "Experimental" Trawling from:
(a) Feb. 1 thru May 15: 4 Stern Trawlers between 55°30'N and 55°N.
(b) Jan. 1-31: 4 Stern Trawlers South of 55°30'N.
4. IPHC Area 4B.
E
A
B
100 Fathom Curve

Figure 6.--Area-time closures and restrictions for Japanese trawl fisheries in southeastern Bering Sea, effective through December 31, 1976.

Prepared November 28, 1975
National Marine Fisheries Service
Juneau, Alaska

U.S.-JAPAN FISHERIES AGREEMENTS CONCERNING THE U.S. CONTIGUOUS FISHERY ZONE OFF ALASKA--DECEMBER 1974


U.S.S.R.
JAPAN WILL NOT, ON HIGH SEAS, TRAWL DURING 7 DAYS SURROUNDING OPENING OF U.S. HALIBUT SEASON.
JAPAN ALLOWED IN CONTIGUOUS ZONE TO LOAD OFF ST. GEORGE ISLAND NOVEMBER 1 THRU APRIL 30.
ALASKA
CANADA
JAPAN ALLOWED IN CONTIGUOUS ZONE YEAR-ROUND TO LOAD OFF:
1. ST. MATTHEW ISLAND
2. KAYAK ISLAND
3. FORRESTER ISLAND
4. AFOGNAK ISLAND
5. SANAK ISLAND
JAPAN ALLOWED IN CONTIGUOUS ZONE, BERING SEA TO:
1. LONGLINE AND LOAD DECEMBER 1 THRU MAY 31. TRAWL MAY 16 THRU 31.
2. LONGLINE AND LOAD FEBRUARY 16 THRU SEPTEMBER 14. TRAWL MAY 16 THRU SEPTEMBER 14.
3. LONGLINE AND LOAD YEAR-ROUND. TRAWL MAY 16 THRU NOVEMBER 30.
4. LONGLINE TRAWL AND LOAD YEAR-ROUND.
5. LONGLINE AND LOAD APRIL 1 THRU OCTOBER 31.
6. LONGLINE AND LOAD YEAR-ROUND. TRAWL MAY 1 THRU DECEMBER 31.
JAPAN WILL NOT, ON HIGH SEAS:
1. LONGLINE OR TRAWL AUGUST 10 THRU MAY 31.
2. TRAWL BETWEEN 147W AND 157W FEBRUARY 16 THRU MAY 15.
3. LONGLINE OR TRAWL BETWEEN 140W and 147W DECEMBER 1 THRU FEBRUARY 15.
4. LONGLINE SEPTEMBER 15 THRU FEBRUARY 15. TRAWL AUGUST 10 THRU MAY 31.
5. TRAWL DURING 7 DAYS SURROUNDING OPENING OF U.S. HALIBUT SEASON.
JAPAN ALLOWED IN CONTIGUOUS ZONE, NORTH PACIFIC TO:
1. LONGLINE AND LOAD YEAR-ROUND. TRAWL MAY 1 THRU DECEMBER 31.
2. LONGLINE AND LOAD APRIL 1 THRU OCTOBER 31. TRAWL JULY 1 THRU OCTOBER 31.
3. LONGLINE AND LOAD APRIL 1 THRU OCTOBER 31.
4. LONGLINE, TRAWL AND LOAD YEAR-ROUND.
5. LONGLINE AND LOAD FEBRUARY 16 THRU SEPTEMBER 14.
JAPAN ALLOWED IN CONTIGUOUS ZONE TO LOAD OFF:
1. UNALASKA ISLAND JANUARY 1 THRU OCTOBER 14.
2. UMNAK ISLAND OCTOBER 15 THRU DECEMBER 31.
65°
60°
55°
50°
45°
165°
170°
175° E
180°
175° W
170°
165°
160°
155°
150°
145°
140°
135°
130°

Prepared January 1975
National Marine Fisheries Service

Figure 7.--Area-time closures and restrictions for Japanese trawl and longline fisheries in the Gulf of Alaska, effective through December 31, 1976.

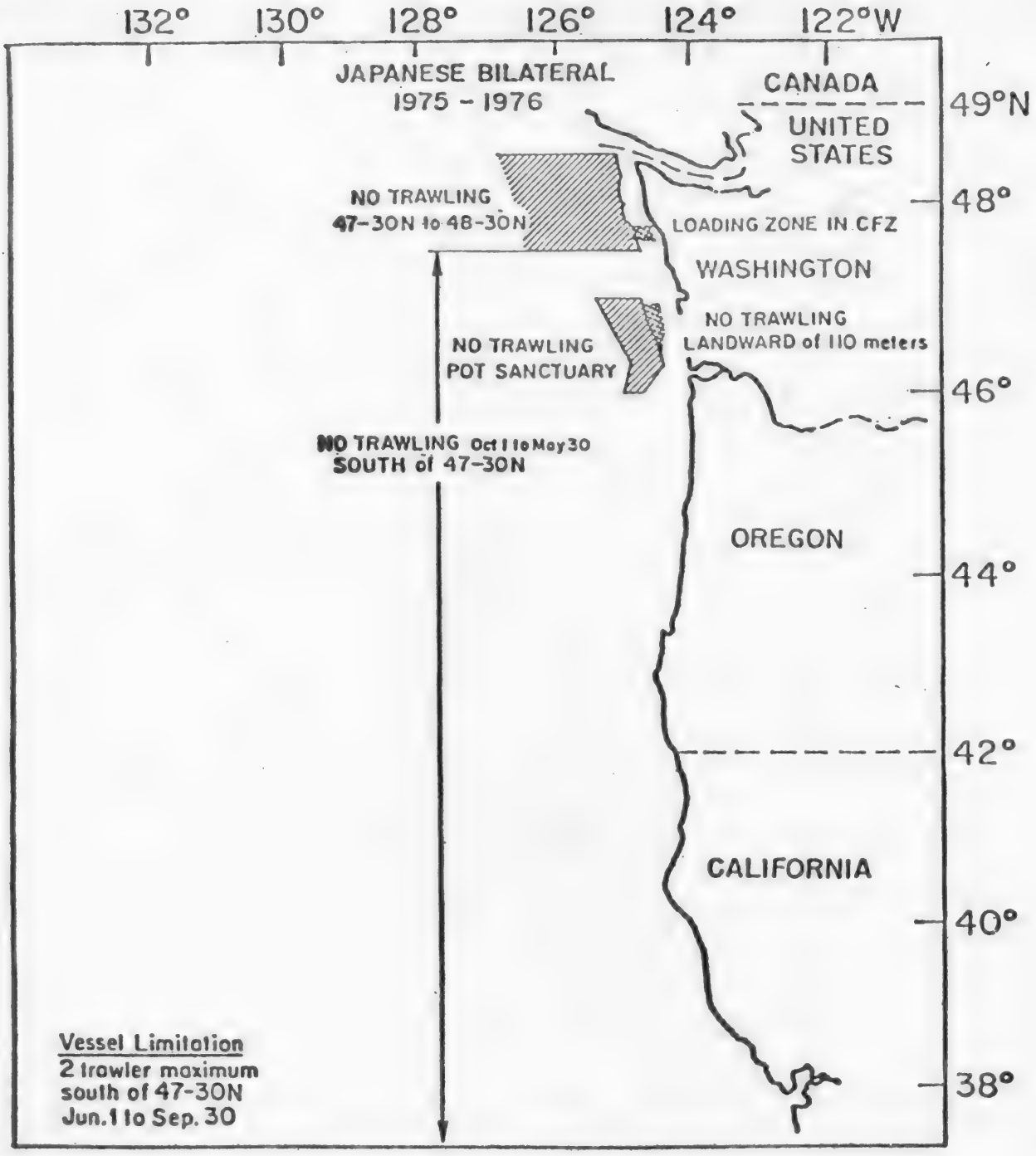


Figure 8.—Area-time closures and restrictions for Japanese trawl fisheries in Washington-California Region, effective through December 31, 1976.

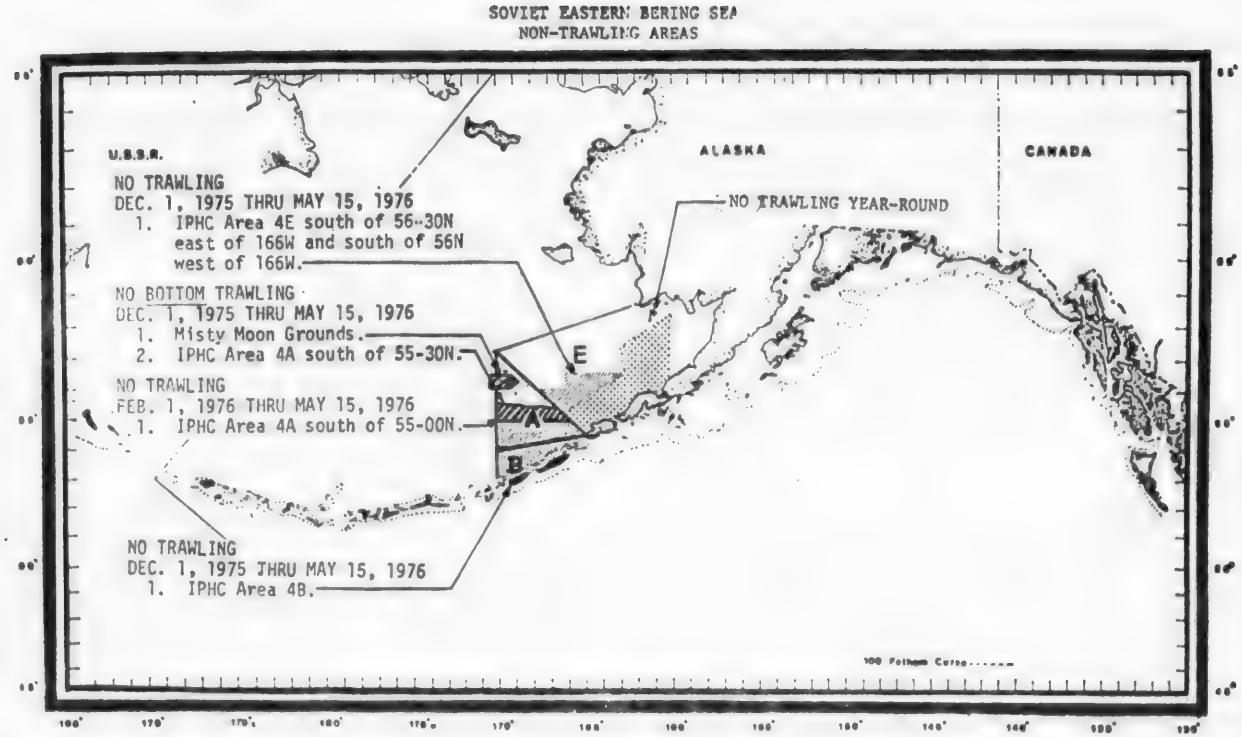


Figure 9.--Area-time closures and restrictions for Soviet trawl fisheries in southeastern Bering Sea, effective through December 31, 1976.

Prepared November 28, 1975
National Marine Fisheries Service
Juneau, Alaska

U.S. - U.S.S.R. FISHERIES AGREEMENT CONCERNING
THE U.S. CONTIGUOUS FISHERY ZONE OFF ALASKA JULY 1975

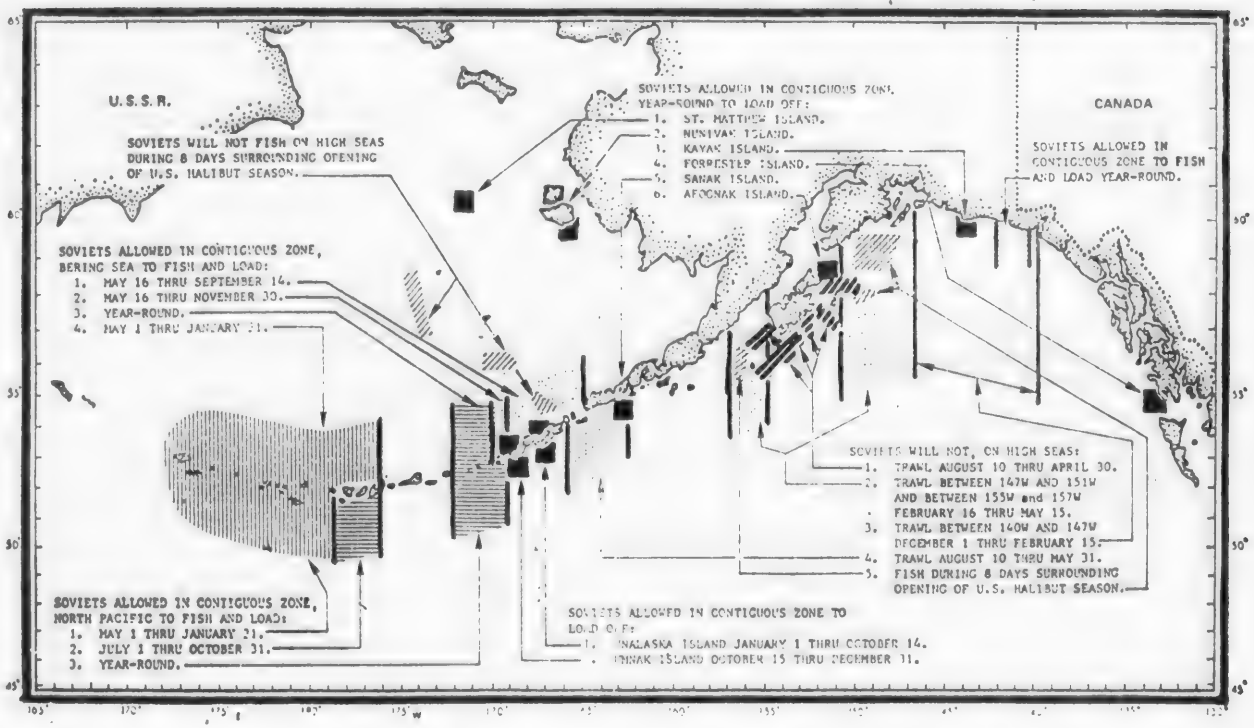

U.S.S.R.
SOVIETS WILL NOT FISH ON HIGH SEAS DURING 8 DAYS SURROUNDING OPENING OF U.S. HALIBUT SEASON.
SOVIETS ALLOWED IN CONTIGUOUS ZONE, BERING SEA TO FISH AND LOAD:
1. MAY 16 THRU SEPTEMBER 14.
2. MAY 16 THRU NOVEMBER 30.
3. YEAR-ROUND.
4. MAY 1 THRU JANUARY 31.
SOVIETS ALLOWED IN CONTIGUOUS ZONE, NORTH PACIFIC TO FISH AND LOAD:
1. MAY 1 THRU JANUARY 21.
2. JULY 1 THRU OCTOBER 31.
3. YEAR-ROUND.
SOVIETS ALLOWED IN CONTIGUOUS ZONE YEAR-ROUND TO LOAD OFF:
1. ST. MATTHEW ISLAND.
2. NUNIVAK ISLAND.
3. KAYAK ISLAND.
4. FORRESTER ISLAND.
5. SANAK ISLAND.
6. AFOGNAK ISLAND.
CANADA
SOVIETS ALLOWED IN CONTIGUOUS ZONE TO FISH AND LOAD YEAR-ROUND.
SOVIETS WILL NOT, ON HIGH SEAS:
1. TRAWL AUGUST 10 THRU APRIL 30.
2. TRAWL BETWEEN 147W AND 151W AND BETWEEN 155W and 157W FEBRUARY 16 THRU MAY 15.
3. TRAWL BETWEEN 140W AND 147W DECEMBER 1 THRU FEBRUARY 15.
4. TRAWL AUGUST 10 THRU MAY 31.
5. FISH DURING 8 DAYS SURROUNDING OPENING OF U.S. HALIBUT SEASON.
SOVIETS ALLOWED IN CONTIGUOUS ZONE TO LOAD OFF:
1. UNALASKA ISLAND JANUARY 1 THRU OCTOBER 14.
2. UNIMAK ISLAND OCTOBER 15 THRU DECEMBER 31.
65°
60°
55°
50°
45°
165°
170°
175° E
180°
175° W
170°
165°
160°
155°
150°
145°
140°
135°

Figure 10.--Area-time closures and restrictions for Soviet trawl fisheries in the Gulf of Alaska, effective through December 31, 1976.

Prepared August 1975
National Marine Fisheries Service
Juneau, Alaska

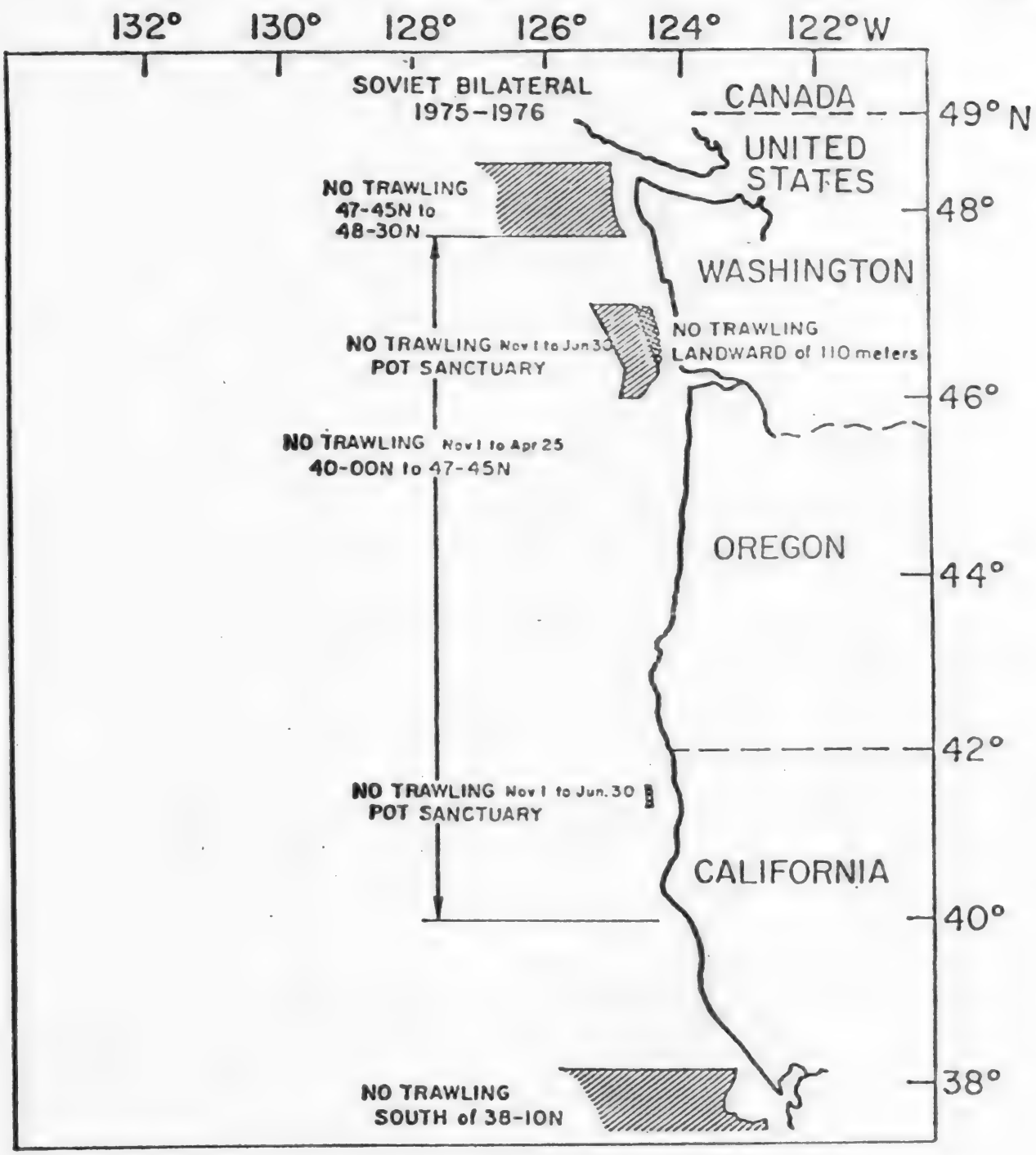


Figure 11.--Area-time closures and restrictions for Soviet trawl fisheries in the Washington-California Region, effective through December 31, 1976.

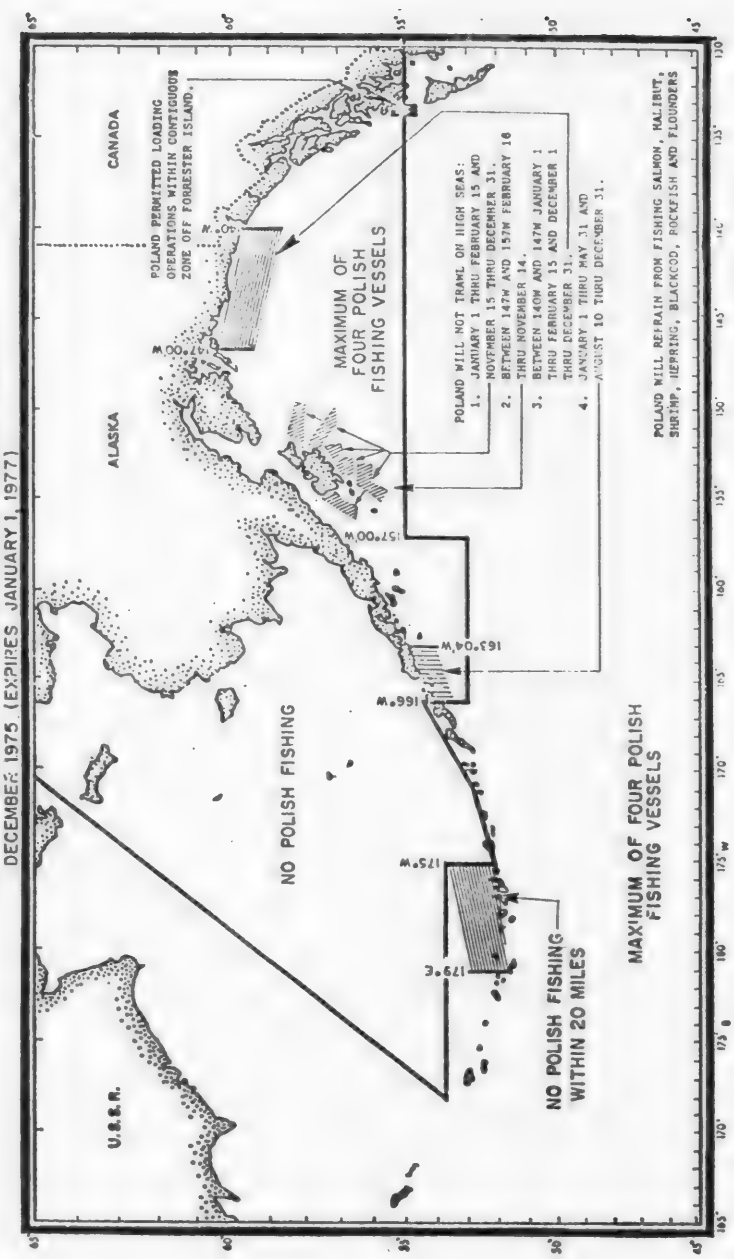

US-POLAND FISHERIES AGREEMENT
DECEMBER 1975 (EXPIRES JANUARY 1, 1977)
CANADA
ALASKA
U.S.S.R.
POLAND PERMITTED LOADING OPERATIONS WITHIN CONTIGUOUS ZONE OFF FORRESTER ISLAND.
MAXIMUM OF FOUR POLISH FISHING VESSELS
POLAND WILL NOT TRAWL ON HIGH SEAS:
1. JANUARY 1 THRU FEBRUARY 15 AND NOVEMBER 15 THRU DECEMBER 31.
2. BETWEEN 147W AND 157W FEBRUARY 16 THRU NOVEMBER 14.
3. BETWEEN 140W AND 147W JANUARY 1 THRU FEBRUARY 15 AND DECEMBER 1 THRU DECEMBER 31.
4. JANUARY 1 THRU MAY 31 AND AUGUST 16 THRU DECEMBER 31.
NO POLISH FISHING
157°00'W
163°04'W
166°W
175°W
179°E
NO POLISH FISHING WITHIN 20 MILES
MAXIMUM OF FOUR POLISH FISHING VESSELS
POLAND WILL REFRAIN FROM FISHING SALMON, HALIBUT, SHRIMP, HERRING, BLACKCOD, ROCKFISH AND FLOUNDERS
Prepared January 1976
National Marine Fisheries Service
Juneau, Alaska

Figure I2.--Area-time closures and restrictions for fisheries of the Polish People's Republic in the Gulf of Alaska, effective through December 31, 1976.

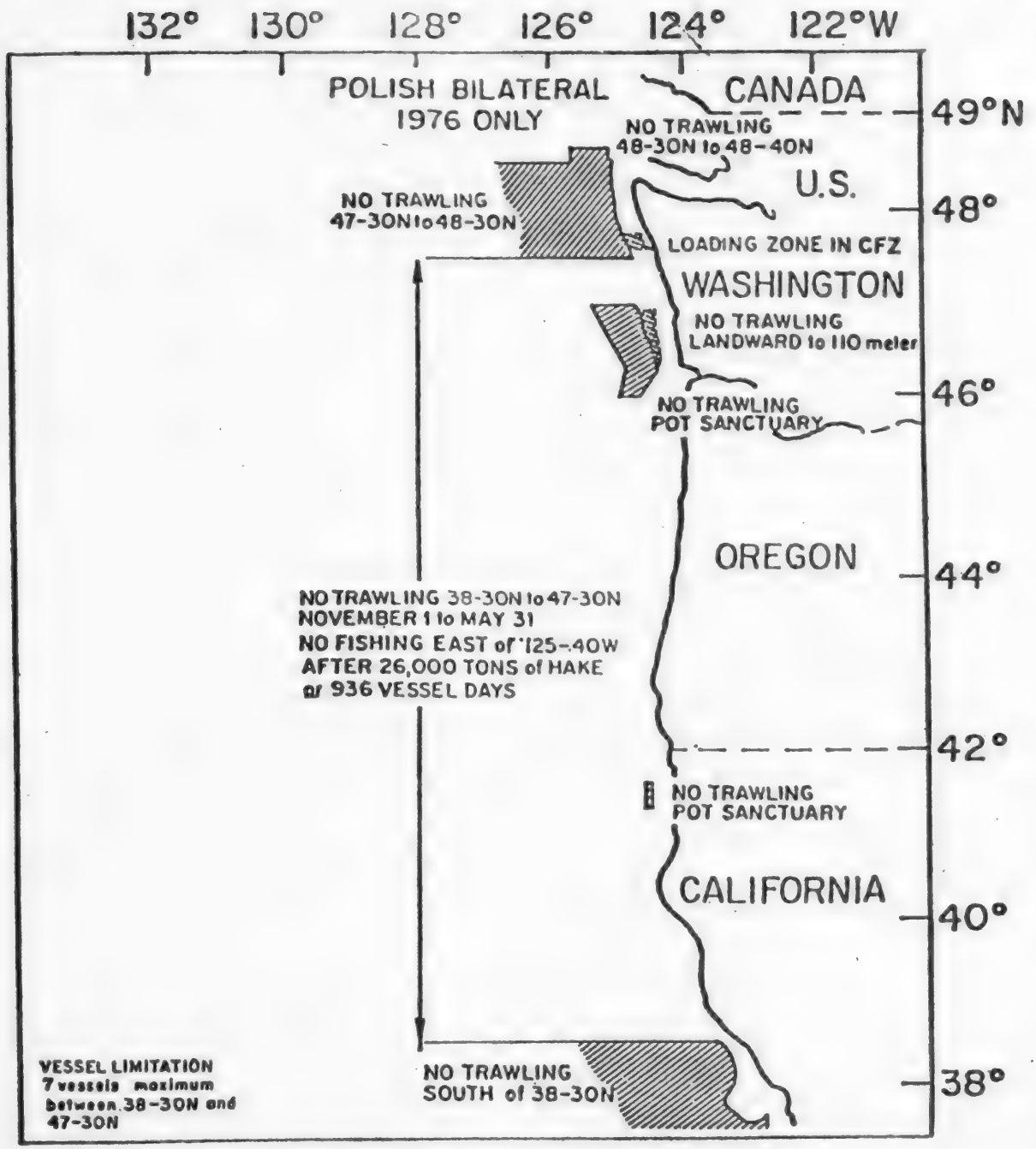


Figure 13.—Area-time closures and restrictions for fisheries of the Polish People's Republic in the Washington-California Region, effective through December 31, 1976.

Figures 7 to 13 except Figure 9, define those closures that are primarily imposed with such objectives in mind. Trawling closures off the Pacific Northwest—imposed on Japan (Figure 8), the U.S.S.R. (Figure 11), and Poland (Figure 13)—are to reduce fishing competition for U.S. fishermen and to create sablefish trap (pot) sanctuary areas off Oregon and California. The no trawling (landward of 110 m) area off Washington is imposed to prevent trawling interferences with salmon sports-fishing charter boats.

Area-time closures to trawling and longlining activities in the Bering Sea, off the Aleutian Islands and in the Gulf of Alaska (Figures 5, 7, 9, 10, 12) are imposed primarily to reduce the incidental catch of halibut and gear conflict during the Pacific halibut fishing season. Because crabs are creatures of the continental shelf and under coatstal state jurisdiction, certain crab sanctuary areas were created to prevent gear conflicts and damage to crab stocks in the eastern Bering Sea (Figure 6).

All these area-time closures indirectly offer the U.S. sablefish fishery off Alaska, Washington, Oregon, and California some form of protection.

(2) *To Protect Status of Stocks.* Sablefish catch quotas on Japan in the northeastern Pacific Ocean are aimed at protecting the status of stocks. Indirect catch quotas on sablefish such as part of an "other species" quota in the Bering Sea and Aleutian Region for Japan and the U.S.S.R. and for the U.S.S.R. in the Gulf of Alaska are probably not very effective for stock protection.

The restriction on the Polish People's Republic from developing a specialized fishery for sablefish in the northeastern Pacific is imposed to protect the status of stocks, as the stocks are considered fully or overexploitated.

The "no trawling" area off Washington (Figures 8, 11, and 13) is imposed to protect rockfish stocks but offers some protection ot sablefish as well.

(3) *Interpretations of Results of Management Actions.* Area-time closures (though not specifically meant to protect sablefish) and catch quota restrictions for 1975 and 1976 are very important steps toward conserving the sablefish resource. Their effectiveness, however, is reduced significantly because sablefish fisheries of other countries, such as that of the Republic of Korea, are not under control at this time.

By mid-1976, the Republic of Korea may have at least 13 longline and 4 trap vessels fishing for sablefish as the target species in the northeastern Pacific Ocean. This compares with the 22 longline vessel limitation imposed on Japan for the same area. Although R.O.K. catches are still lower than those of Japan, the R.O.K. has announced the intention to fish 23 longline/trap vessels for a target catch of 18,000 mt in 1976 (footnote 8) which, if achieved, will certainly upset the present conservation measures. At present, the R.O.K. fishery is not limited in fleet size or catch limitation except that it refrains from catching Pacific halibut, crab, and salmon (Figure 14).

U. S.-REPUBLIC OF KOREA (SOUTH KOREA) FISHERIES AGREEMENT
NOVEMBER 1972

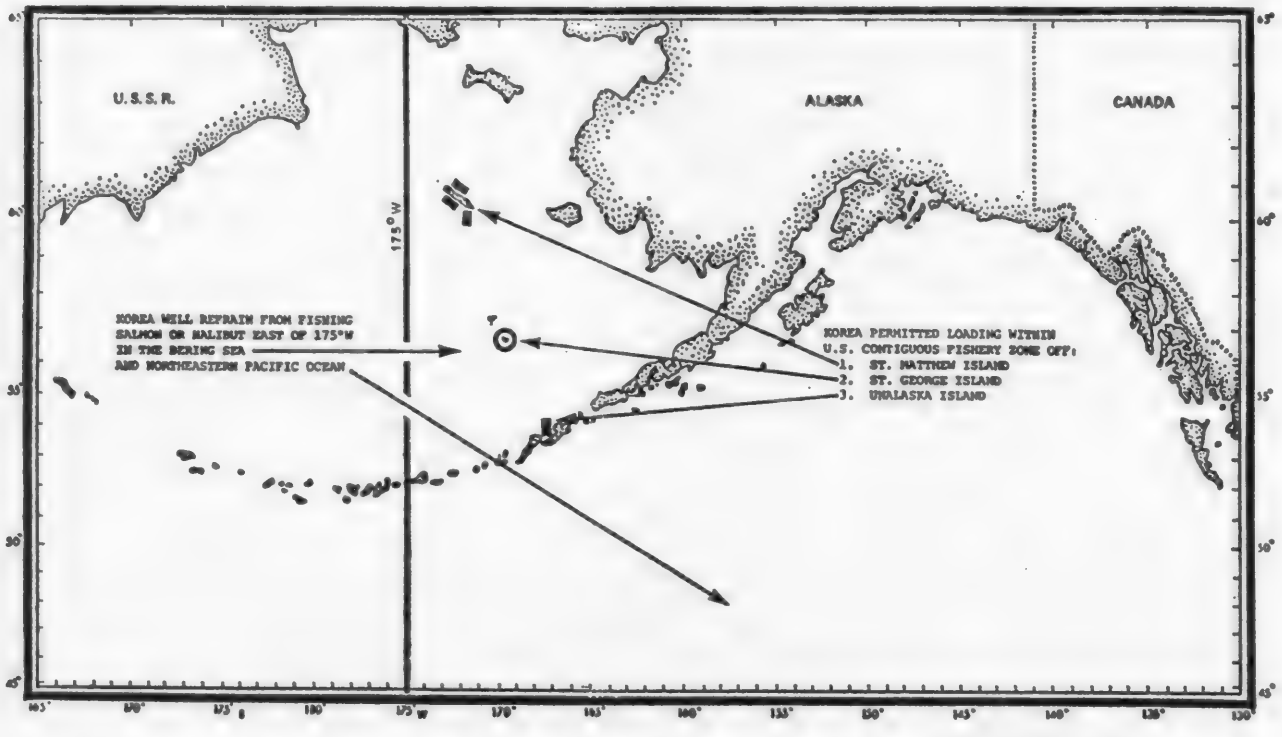

U.S.S.R.
ALASKA
CANADA
175° W
KOREA WILL REFRAIN FROM FISHING SALMON OR HALIBUT EAST OF 175°W IN THE BERING SEA AND NORTHEASTERN PACIFIC OCEAN
KOREA PERMITTED LOADING WITHIN U.S. CONTIGUOUS FISHERY ZONE OFF:
1. ST. MATTHEW ISLAND
2. ST. GEORGE ISLAND
3. UNALASKA ISLAND

Figure 14.--Provisions of the United States-Republic of Korea Fisheries Agreement, effective through December 12, 1977.

Prepared December 1972
National Marine Fisheries Service
Juneau, Alaska

The Republic of China (Taiwan) is another newcomer into the sablefish fishery. A longliner from Taiwan was observed fishing sablefish on an exploratory basis in late August 1975 in the Gulf of Alaska and additional vessels appeared in early 1976. The Republic of China has one of the largest tuna longline fleets in the world, and their tuna catches have been poor. These longliners could easily be converted and diverted to fish for sablefish in the northeastern Pacific Ocean.

At present, the fisheries of the Federal Republic of Germany (West Germany) and the German Democratic Republic (East Germany) are small and were made up of no more than five vessels in 1975. These countries fish for Pacific hake and rockfish and do not fish for sablefish in large amounts.

(4) *Violations and Gear Losses.* The foreign fisheries for sablefish have produced a number of violations of international agreements, of the contiguous fishery zone, and of the continental shelf fisheries resources of the United States (Table 3). A complete list of such violations is available from the NMFS Northwest and Alaska Fisheries Center. The three violations of international agreements involved illegal retention of halibut. Six of the eight violations of U.S. waters were for vessels fishing within the contiguous fisheries zone and two (Japan) were for fishing within the territorial sea.

Table 3.--Violations of international fisheries agreements and of the U.S. waters and continental shelf fishery resources by foreign longline vessels fishing for sablefish.

Nation	Violations	
	U.S. waters and CSFR*	International fisheries agreements
Japan	6	3
Republic of Korea	1	-
Republic of China	1	-

* Continental Shelf Fishery Resources

F. HISTORY OF COOPERATIVE RESEARCH AND STATISTICAL EXCHANGE

Of all the countries fishing for sablefish in the North Pacific, Japan is the only one that has provided the U.S. with statistics of its fishery in details sufficient enough to make status of stock evaluations. Japan has furnished catch records of its fisheries since their inception (in the post-World War II period, since 1954) and the statistics have been among the most detailed and useful that are compiled by any nation in the world.

The U.S.S.R. began fishing in the Bering Sea in 1959, but only began providing the U.S. with catch and effort data in 1967. Although vessels from the Republic of Korea first began fishing in the Bering Sea in 1967, no statistics had been provided to the U.S. on its operations to the time of this writing (August 1976), nor has the Republic of China provided any data of its catches.

The U.S.S.R., Canada, and Japan have taken an active part in an extensive U.S. sablefish tagging program. The Republic of Korea, however, has returned the largest number of tags recovered by foreign fisheries to the U.S. (Table 4) because its fisheries operate in or near the area of tagging and therefore encounter more opportunities for tag recoveries. On the other hand, considering that Japan accounts for 87 percent of annual sablefish landings in the northeastern Pacific, it is possible that the Japanese commercial fishery has not been detecting or returning most of the tags recovered. It is also true for the Soviet fishery in that most of the tags returned by the U.S.S.R. were recovered by research vessels.

Table [illegible]

Reporting Nation	No. Reported	% of Total
U.S.	572	78.0 %
Korea	66	9.0
[illegible]	39	5.3
Japan	35	4.8
[illegible]	19	2.6
[illegible]	2	0.3
Total	733	100.0 %

[illegible], K. S. 1976. [illegible] relative sablefish tagging research program. Natl. Mar. Fish. Serv., Northwest Fish. Cent. Unpublished. 3 p. [Report submitted to the Tech. Sub-Committee of the International Groundfish Committee, 1976.]

In other cooperative ventures with the U.S., Japan has a long history of permitting U.S. fisheries observers aboard their commercial vessels and to conduct biological sampling. However, the U.S. has not made any request for observers aboard longline vessels. Except for a few U.S. observer trips aboard Soviet research vessels, no other observer programs are ongoing with countries fishing sablefish.

3.0 Status of Stocks

A. Distribution and Abundance of Exploited Stocks

Although sablefish are geographically widely distributed, the exploitable biomass is largely confined to the outer continental shelf and slope (150–1,200 m) and to the central portion of its range. Survey data and catch results suggest that the region of highest abundance is in the Gulf of Alaska—especially from the Shumagin Islands southeastward to northern Queen Charlotte Sound. The relative distribution of the biomass is approximately 67 percent in the Gulf of Alaska, 13 percent each in the Bering Sea and Vancouver-California Region, and the remaining 7 percent in the Aleutian Region (Figure 15). Data on the size of stocks off southern California are lacking. Isaacs and Schwartzlose (1975) using photographic techniques reported that sablefish are considerably more abundant than noted previously on the deep-sea floor (800–1,500 m) in the southern part of their reported distribution.

Survey data suggest that about 3 percent of the exploitable biomass is found in waters shallower than 200 meters, 16 percent between 200 and 400 meters, 28 percent between 400 and 600 meters, 29 percent between 600 and 800 meters, 20 percent between 800 and 1,000 meters, and the rest (4 percent) below 1,000 meters (Figure 15).

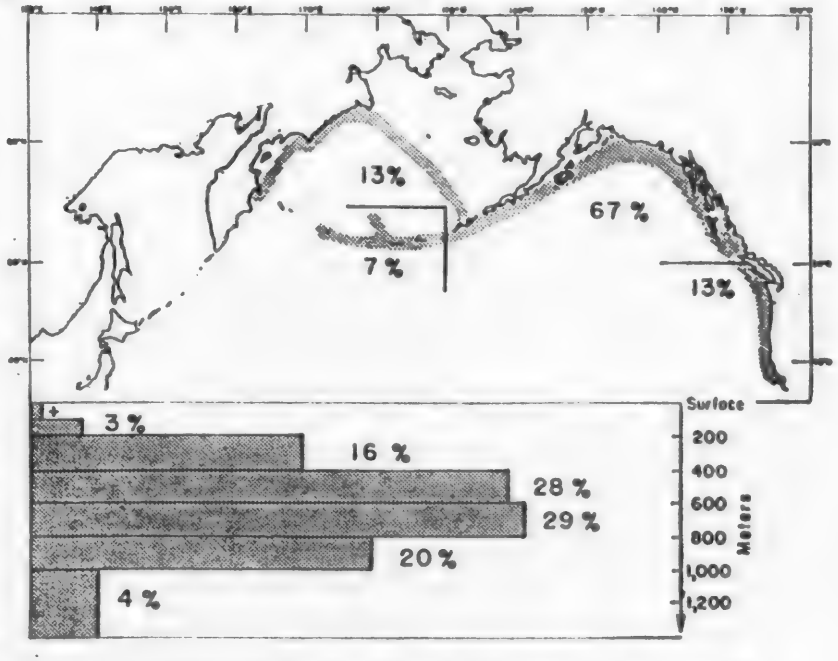


Figure 15.—Relative geographic and bathymetric abundance of exploitable sablefish biomass, by percentage of total. (Developed from Low, footnote 2, and Table 64 of Alverson et al, 1964).

B. ESTIMATED MAXIMUM SUSTAINABLE YIELD

Using the surplus production model (Schaefer 1954, 1957; Fox 1971, footnote 9), and assuming that sablefish is one unit stock from the Bering Sea to California and in steady state conditions, Low et al. (footnote 3) estimated the maximum sustainable yield to be 42,600 to 46,500 metric tons. It should be noted, however, that this range is the theoretical long-range maximum sustainable level and not necessarily the present equilibrium yield level, which has to take into consideration such factors as present stock structure and abundance trends.

It was also determined in Low et al. (footnote 3) that the optimum age of exploitation appear to be about age 5 or fish about 53–55 cm (fork length). This is based upon yield-per-recruit-analysis (of Beverton and Holt 1957) and an approximation procedure of Alverson and Carney (1975).

C. CURRENT STATUS OF STOCKS

(1) *Sources of Data.* The sources of data used for status of stock analyses are:

(1) Catch-effort statistics of the Japanese North Pacific Longline fisheries in the Bering Sea, Aleutian Region, and northeastern Pacific Ocean.

(2) Catch-effort statistics for the Japanese land-based dragnet fishery in the Bering Sea and the Aleutian Region.

(3) Catch-effort statistics of U.S. trawlers operating in the Eureka-Monterey Region off California.

(4) U.S. National Marine Fisheries Service (NMFS) surveillance data on Japanese longline fishing effort in the Aleutian Region and the Gulf of Alaska (Shumagin to southeastern Alaska).

(5) Information on size composition of sablefish caught by Japanese longline fisheries.

Data concerning the U.S.S.R. and R.O.K. fisheries are inadequate for stock appraisal. Groundfish surveys conducted by the Northwest Fisheries Center, NMFS, do not reach the depths where sablefish are abundant.

(2) *Catch-per-unit-effort (CPUE) Estimators of Abundance.* The following types of CPUE information are used to measure sablefish abundance:

(1) catch per 10 hachi longline units,

(2) catch per hour of trawling by stern trawlers,

(3) catch per longline boat-day, and

(4) catch per stern trawl boat-day.

In the case of longline gear, the usual unit of fishing effort has been the "hachi" (skate). The fishing efficiency of a hachi, however, depends on such factors as the condition and quality of bait, duration of soaking and searching time for productive fishing grounds, depth of fishing, and hook spacing. By using catch per longline boat-day, however, soaking and searching times are at least taken into account—resulting in a less biased index of sablefish abundance, assuming other fishing conditions remain fairly stable.

In the case of trawl gear, the total number of days spent fishing is likely to give a better estimate of effort than total towing time if searching plays a substantial role in trawl fishing operations. Japanese trawl statistics generally provide number of hours of trawling except in the land-based dragnet fishery, which provides number of boat-days as well. Therefore, catch per boat-day is also computed for comparison with other indices of abundance.

(3) *Catch-per-unit-effort Results.* a. Bering Sea.—In Areas 1 and 2, longlining activities were substantially reduced from 1964 to 1965; but, since 1965, effort has fluctuated without a definite pattern (Figure 16 and Appendix 1). In Area 1, catch rates (kg per 10 hachi) declined from 334 in 1966 to 120 in 1972 and increased slightly to 161 in 1974. In Area 2, catch rates (kg per 10 hachi) fluctuated between 124 and 243 during 1966–70, decreased substantially from 243 in 1970 to 31 in 1973, and increased 3-fold to 111 in 1974.

Longlining activities were phased out in Area 4 after 1967 and in Area 3 after 1970 because of trawling activities on the grounds. Consequently, catch rates of the land-based dragnet fishery are used for measuring sablefish abundance in these areas. Some land-based trawling activities also took place in Area 2 and their catch rates were also computed. The land-based dragnet fishery does not operate in Area 1.

The catch rate data from the land-based stern trawlers (catch per hour and catch per boat-day) show that abundance of sablefish has been declining since 1967 in Areas 2, 3, and 4 (Figure 16, Appendix 2).

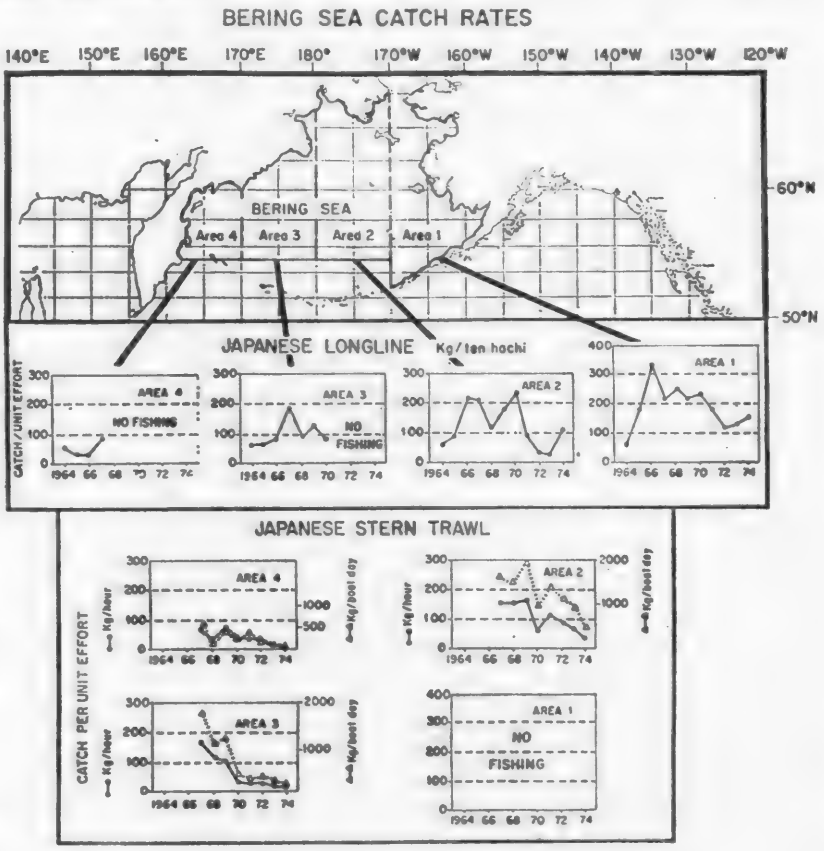


Figure 16.—Catch per unit effort trends for sablefish by Japanese longliners and land-based stern trawlers by area in the Bering Sea.

In summary, longline and stern trawl data show that, compared to 1967, catch rates for 1974 were down by 24 percent in Area 1, 49–79 percent in Area 2, 91–93 percent in Area 3, and 82–93 percent in Area 4. On the whole, catch rates in the Bering Sea have been declining since 1969, or earlier.

b. Aleutian Region.—Four indices of sablefish abundance were determined: longline catch per 10 hachi units (Appendix 3), longline catch per boat-day (Appendix 4), land-based stern trawl catch per hour, and catch per boat-day (Appendix 3).

Longline catch rates (kg per 10 hachi) have remained generally high and at relatively stable levels of 165–202 since 1968 (Appendix 3. Figure 17). Longline catches per boat-day, however, have declined precipitously from 11,810 kg per boat-day in 1972 to 4,260 kg per boat-day in 1974 (Appendix 3). A similar trend occurred in stern trawl catch rates (Figure 17): catch per hour declined from 222 kg per hour in 1971 to 45 kg per hour in 1974, and catch per boat day dropped from 2,077 kg per boat-day in 1971 to less than 459 kg per boat-day in 1974.

In Sasaki et al. (footnote 1), it was concluded that sablefish abundance, as inferred from catch per hachi trends, appeared favorably high through 1973. On the other hand, the other three indicators, suggest that sablefish abundance has been declining rapidly since 1971–72.

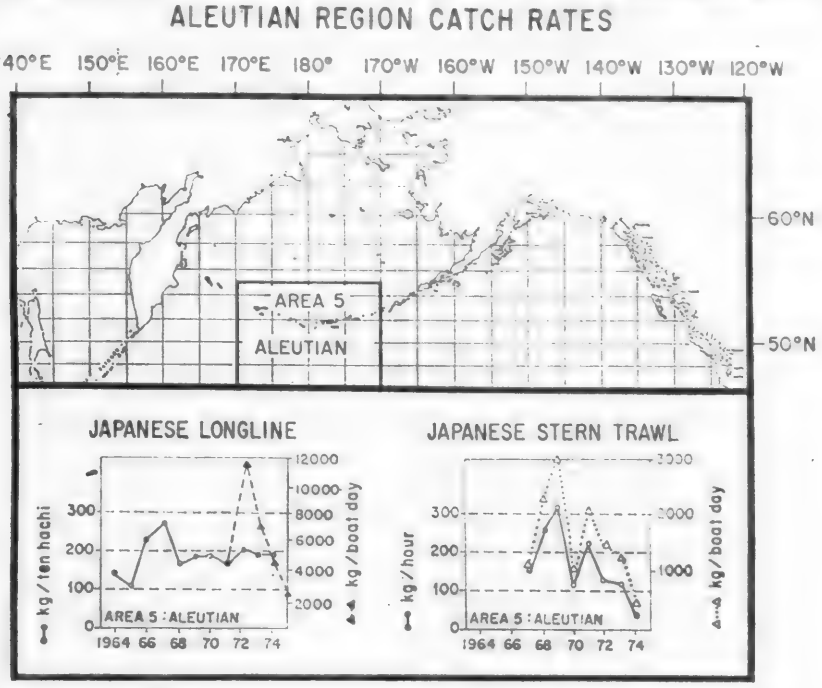


Figure 17.—Catch per unit effort trends for sablefish by Japanese longliners and land-based stern stern trawlers in the Aleutian Region.

c. Northeastern Pacific Ocean.—Three indices of sablefish abundance were determined: longline catch per 10 hachi for Areas 6–10 (western Gulf of Alaska to Columbia, Appendix 5), longline catch per boat-day for the entire Gulf of Alaska (western Gulf to southeastern Alaska, Appendix 4), and U.S. trawl catch per hour for Area 11 (Eureka-Monterey, Appendix 6).

Longline catch per hachi in the northeastern Pacific has typically been much higher than in the Bering Sea and about the same as in the Aleutian Region. During 1974, catch rates in all areas, except Area 10 (Vancouver-Columbia), fell below 200 kg per 10 hachi for the first time since 1971. Using the peak year of 1970 as a basis, catch rates dropped by 13 percent in Area 6, 27 percent in Area 7, 25 percent in Area 8, and 13 percent in Area 9 (Figure 18). In Area 10, where Japanese longliners did less fishing, catch rates increased 2 percent.

Since longline soaking and searching time have not been accounted for, the effective fishing effort may be greater than indicated and catch rates may be overestimated in recent years. In regard to this, longline catch per boat-day data in the Gulf of Alaska (Appendix 4), dropped from 11,890 kg per boat-day in 1971 to 5,900 kg per boat-day in 1974—a decrease of about 50 percent. Such a reduction is greater than the change in catch per 10 hachi in any subarea for the same period, which ranged from 13 to 27 percent. As in the case of the Aleutian Region, the validity of catch per hachi as an index of sablefish abundance is questionable. Whichever index was used, however, each pointed out that sablefish abundance has been decreasing since 1970–71 in the entire Gulf of Alaska.

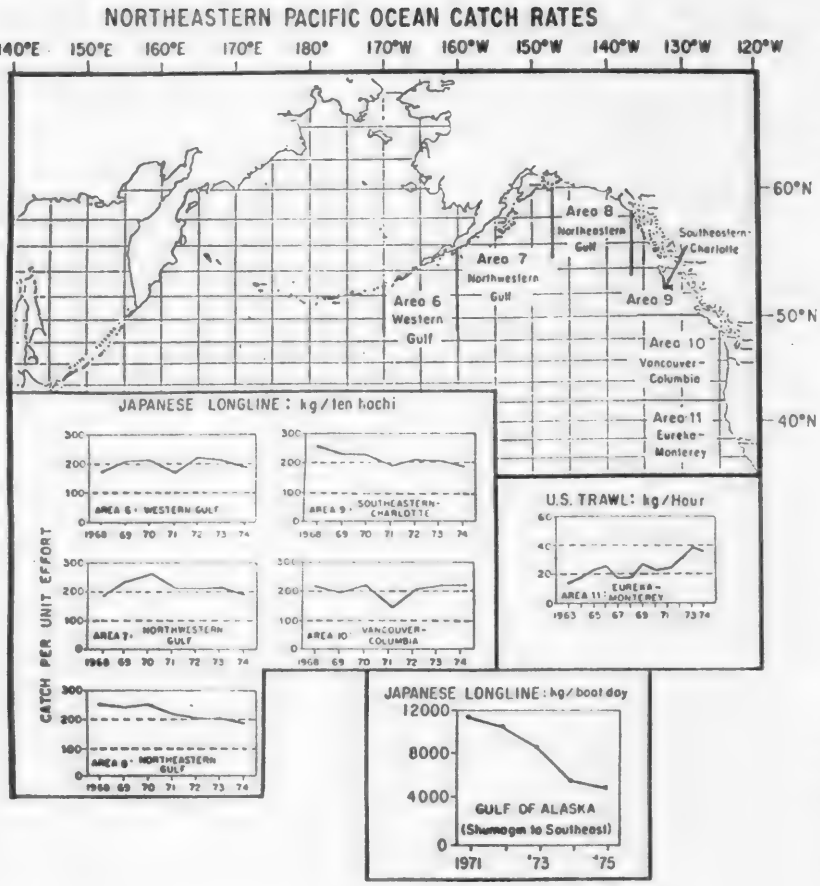

NORTHEASTERN PACIFIC OCEAN CATCH RATES
140°E 150°E 160°E 170°E 180° 170°W 160°W 150°W 140°W 130°W 120°W
60°N
50°N
40°N
Area 8 Northeastern Gulf
Southeastern Charlotte
Area 7 Northwestern Gulf
Area 6 Western Gulf
Area 9
Area 10 Vancouver-Columbia
Area 11 Eureka-Monterey
JAPANESE LONGLINE : kg/ten hachi
CATCH PER UNIT EFFORT
AREA 6 · WESTERN GULF
AREA 9 · SOUTHEASTERN-CHARLOTTE
AREA 7 · NORTHWESTERN GULF
AREA 10 · VANCOUVER-COLUMBIA
AREA 8 · NORTHEASTERN GULF
U.S. TRAWL: kg/Hour
AREA 11 · EUREKA-MONTEREY
JAPANESE LONGLINE : kg/boat day
GULF OF ALASKA (Shumagin to Southeast)

Figure 18.—Catch per unit effort trends for sablefish by Japanese longliners and United States trawlers by area in the northeastern Pacific Ocean.

In area 11 (Eureka-Monterey), sablefish catch rates generally increased from 1970 to 1974, as indicated by U.S. trawl data (Appendix 6). The increase may partially be the result of U.S. trawlers specifically seeking out sablefish to satisfy higher market demands in recent years.

(4) *Age and Size Composition.* Length and age composition data from the sablefish fisheries are not sufficiently complete in specific time and area sequences to accurately follow the changes in size and age composition of the stock. Since the distribution of sablefish of different size is influenced by depth (Kulikov 1965, Phillips 1954) and season, the data must also be grouped by season, depth strata, and capture gear for comparison. Of the trawl and longline sources of data, the longline data come from a more consistent depth range (500–800 m). Hence, longline data summarized over a period of 1 year and over large geographical areas may be used as a rough indicator of stock composition.

Combining data of all depths between 500 and 800 m, the length and age composition of longline catches are reviewed for the Bering Sea and the northeastern Pacific Ocean. In the Bering Sea, most of the fish from 1963 to 1967, except for 1965, fell within the 58–62 cm fork length or 6–7 year old range. The 1965 fishes were generally larger as were those in 1971 (60–68 cm or 7 to 9 year old fish) and 1973 (58–66 cm or 6 to 8 year old fish). Generally speaking, commercial catches have not changed much in length composition. In the northeastern Pacific Ocean, the size composition of most of the catch since 1969 has fallen within the 58–64 cm (6–8 year old) range. As in the Bering Sea, no remarkable change in length composition is observed. For the entire sablefish fishery, catches are normally represented by 47–70 cm (3–9 year old) range fish.

(5) *Interpretation of Trends in Abundance and Stock Structure.* Regarding the validity of catch-per-unit of effort as an index of sablefish abundance, it is surmised that longline catch per boat-day, stern trawl catch per hour, and stern trawl catch per boat-day are the most valid ones to use. Longline catch per hachi appears to be biased in that soaking time of the gear and searching time for productive fishing grounds have not been accounted for. Therefore, the use of such an index must be viewed with caution.

In all areas north and west of Vancouver Island, trends in catch rate suggest declining fish densities. All four areas of the Bering Sea showed drastic reductions in catch rate from the peak year of 1967, ranging from 24 to 93 percent. In addition, the sablefish stock in 1967 may not have been at full potential because it had been heavily fished in the early 1960's. Stock densities were particularly low in areas 2, 3, and 4 of the Bering Sea.

Although stock densities have been higher in the Aleutian Region and northeastern Pacific Ocean than in the Bering Sea, catch rates may have declined by as much as 50 percent from those of peak years.

Management measures are apparently needed to rebuild sablefish abundance in all regions north and west of Vancouver Island. Sablefish densities are extremely low in areas 2, 3, and 4 of the Bering Sea and fisheries that target on sablefish should be scaled down. In area 1, sablefish conditions, although better than elsewhere in the Bering Sea, require lower exploitation to build up abundance.

Since three out of four indices of abundance in the Aleutian Region have declined drastically after 1971, the stock is considered to be declining in abundance and the all-nation catch of sablefish should be regulated.

In the northeastern Pacific region north of Vancouver Island, lower exploitation rates are needed in all areas (6, 7, 8, and 9) to arrest the decline in abundance. In the Vancouver-Montery region (areas 10 and 11) where abundance trend is stable and high, a reduction in catch of the 1974 level (before expansion of the Republic of Korea sablefish fishery) is probably not necessary at this time.

D. ESTIMATED PRESENT EQUILIBRIUM YIELD

Using the surplus production model, the maximum sustainable yield for the assumed unit of sablefish stock (from the Bering Sea southward to off California)

is estimated to be from 42,600 to 46,500 metric tons. It should be reiterated that this range is the theoretical long-range maximum sustainable level and not necessarily the present maximum equilibrium yield which has to take into consideration such factors as present stock structure and abundance trends.

With regard to stock structure, the data from the sablefish fisheries are not sufficiently complete in specific time and area sequences to accurately follow the change in stock structure.

Stock abundance trends, on the other hand, are more clearly defined. Because catch rates are different between regions and tagging studies show that most sablefish do not conduct long-range migrations, the exploitation strategy for each region should be different. Because of the historical pattern of fishing and similarity of catch rate trends, it appears feasible to manage separately in four regions: the Bering Sea, the Aleutian Region, the Gulf of Alaska (Shumagin-Southeastern Alaska Region), and Washington-California (Columbia-Monterey Region). The area off Canada (Charlotte-Vancouver Region) will be under Canadian extended jurisdiction and is not analyzed in detail here.

In all areas north and west of Vancouver Island, trends in catch rate suggest declining fish densities. All areas of the Bering Sea showed drastic reductions in catch rate from the peak year of 1967, ranging from 24 to 93 percent. In addition, the sablefish stock in 1967 may not have been at full potential because it had been heavily fished in the early 1960's. Stock densities were particularly low in areas 2, 3, and 4 of the Bering Sea. In the Aleutian Region and northeastern Pacific Ocean, catch rates may have declined by as much as 50 percent from those of peak years.

Sablefish densities are extremely low in the Bering Sea and to improve conditions, it is suggested that the all-nation catch of sablefish in that area not exceed 5,000 mt per year (Figure 19, Table 5). It should be noted that the Bering Sea stock extends beyond the fisheries jurisdiction of the United States.

Since three out of four indices of abundance in the Aleutian Region have declined drastically after 1971, the stock is considered to be declining in abundance, and the all-nation catch of sablefish should be regulated below the catch levels of 1971–74, that is less than 2,400 mt per year.

Table 5.—Recent year catches (in metric tons) of sablefish by area and nation, 1970–74.

	Japan[1/]	USSR[2/]	USA[3/]	Canada[4/]	ROK[5/]	Total
Bering Sea						
1970	9,713	2,874	0	0	0	12,587
1971	12,932	2,830	0	0	0	15,762
1972	13,854	2,137	0	0	0	15,991
1973	6,948	1,220	0	0	0	8,168
1974	5,436	77	0	0	0	5,513
Aleutian Region						
1970	1,191	–	0	0	0	1,191
1971	2,049	170	0	0	0	2,219
1972	2,684	269	0	0	0	2,953
1973	2,322	134	0	0	0	2,456
1974	1,973	14	0	0	0	1,987
Gulf of Alaska (Shumagin to Southeastern Alaska)						
1970	24,384	–	369	–	–	24,753
1971	25,278	–	270	–	–	25,548
1972	35,626	535	1,387	–	308	36,469
1973	27,351	109	869	16	58	28,403
1974	20,274	38	771	10	2,500	25,593
Washington-California (Columbia-Monterey Region)						
1970	66	980	2,487	–	–	3,533
1971	11	762	2,255	–	–	3,028
1972	759	299	3,510	–	6/	4,568
1973	21	121	4,679	–	6/	4,821
1974	0	164	6,100	–	6/	6,264
Off Canada (Charlotte-Vancouver Region)						
1970	5,154	7/	80	327	6/	5,561
1971	3,057	7/	158	327	6/	3,542
1972	4,245	7/	635	1,102	6/	5,982
1973	2,950	7/	64	944	6/	3,958
1974	2,876	7/	111	493	6/	3,480

1/ Japanese data for 1974 are complete through October only.
2/ USSR data for 1970-73 are from INPFC (footnote 5) and for 1974, from U.S.-USSR data exchange.
3/ USA data from NMFS (1970-73) and Rept. of the Tech. Sub-Comm. of the International Groundfish Comm. 16th Ann. meeting, June 25-27, 1975. (Processed)
4/ Canadian data are from PMFC annual reports for 1973-74 and INPFC (see text footnote 5).
5/ ROK data are from INPFC (footnote 5) and U.S.-ROK data exchange.
6/ Included in Gulf of Alaska.
7/ Catch, if any, is included in Columbia-Monterey Region.

In the northeastern Pacific region north of Vancouver Island, lower exploitation rates are needed in all areas to arrest the decline in abundance. To achieve lower exploitation rates in U.S. waters, it is suggested that the all-nation catch be limited to 22,000 mt in the Gulf of Alaska (Shumagin-Southeastern Alaska Region) until catch rates improve substantially.

In the Washington-California (Columbia-Monterey) region where abundance trend is stable and high through 1974, the all-nation catch may be increased safely to 7,000 mt per year.

The total maximum equilibrium yield in U.S. waters is, therefore, 36,400 metric tons. If one adds 5,000 mt for Canadian waters, this figure can be compared with the surplus production model which estimates the long-term MSY range at 42,600–46,500 metric tons for the entire sablefish resource (Figure 19).

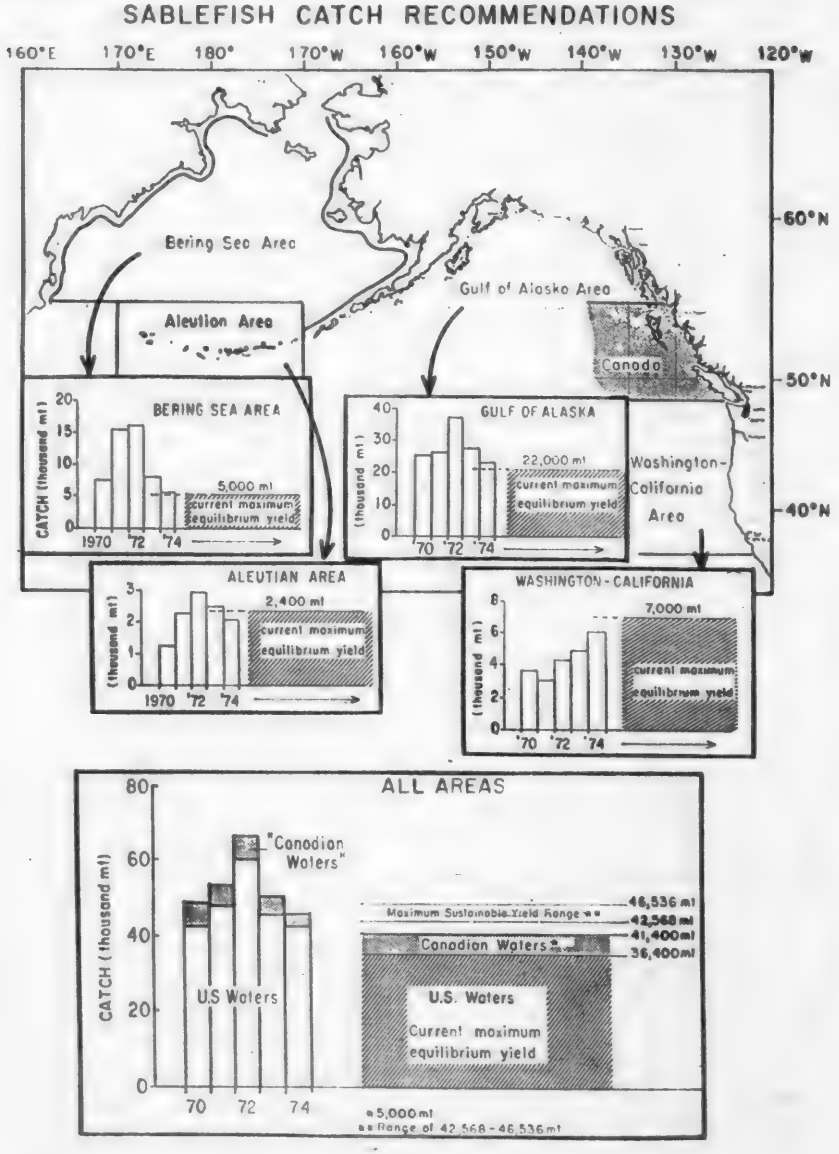


Figure 19.--Recent year trends in sablefish catch and current maximum equilibrium yield by region.

4.0 Total Allowable Catch and Level of Foreign Fishing

A. Optimum Yield

The concept of optimum yield incorporates consideration of a broad range of socio-economic factors relating to impacted fisheries as well as consideration of the biological characteristics of the exploited stocks. In the time and with the data available, it has not been possible to make other than a cursory evaluation of socio-economic factors—hence the optimum yields within this report are considered as equivalent to the total allowable catches (TAC's). These figures have been determined on the basis of biological information on the characteristics of exploited resources with certain adjustments to accommodate for the quality of the data base. Regulations in this Preliminary Plan are concerned only with the activities of foreign vessels and, hence, do not impact in a direct sense on the activity of U.S. fishing. Reduced fishing levels associated with these TAC's should result in improved stock conditions and, therefore, improved economic viability of the U.S. fisheries. Further adjustments of TAC's to attain optimality should be anticipated in succeeding iterations of this management plan.

B. Total Allowable Catch

As mentioned in the section on Estimated Present Equilibrium Yield, the all-nation catch for sablefish should be limited to 5,000 mt in the Bering Sea; 2,400 mt in the Aleutian Region; 22,000 mt in the Gulf of Alaska; and 7,000 mt off Washington-California. These figures are derived from trends on the history of the fishery and status of stocks through 1974.

C. Total Allowable Level of Foreign Fishing

Since 1974 the Republic of Korea has expanded its sablefish fishery off the coast of southeastern Alaska to California. Coincident to the R.O.K. expansion, U.S. sablefish fishermen fishing off Washington and Oregon have reported poor catch rates and loss of gear due to foreign fishing activities (especially by R.O.K.) in 1976 as opposed to past years; some are discouraged to the point where they are reverting from the sablefish trap fishery to salmon trolling (Pereyra, footnote 6). Typical catch rates and problems encountered by the Washington-California sablefish trap fishery are shown in Figure 20.

Because of declining catch rates in the Washington-California area and the adverse economic impact foreign fisheries have created on U.S. sablefish fishermen, compounded with the growing importance of sablefish to the U.S. consumer and the domestic production potential to catch all of the 7,000 mt of sablefish equilibrium yield, there should be no

foreign fisheries for sablefish off Washington-California.

In the Gulf of Alaska, the U.S. have the potential to harvest 2,500 mt of sablefish in 1977 as projected by the fishing industry, thereby leaving 19,500 mt for foreign fisheries. Rapid expansion of the U.S. sablefish fishery is taking place in the Southeast Area and due to socio-economic considerations, foreign catch limitations are also necessary here. According to 1970–73 catch trends, the total catch in the Southeast Area should not exceed 5,950 mt (27 percent of 22,000 mt TAC). Of this amount, as much as 2,200 mt has been prorated to be taken by U.S. fishermen. Therefore, a catch surplus of 3,750 metric tons is available for foreign fisheries in the Southeast Area. The U.S. does not have a sablefish fishery in the Aleutian Region and the Bering Sea; therefore, all 2,400 mt in the Aleutian Region and 5,000 mt in the Bering Sea could be surplus for foreign fisheries in 1977.

These surplus figures for foreign fisheries and additional measures on vessel-gear limitations and area-time closures will be recommended.

5.0 CONSERVATION AND MANAGEMENT MEASURES APPLICABLE TO FOREIGN FISHERIES

A. DESCRIPTION OF MEASURES

General restrictions on foreign sablefish fisheries are:

(a) No retention of salmon, Pacific halibut (except for Canadian fishermen under provisions of the Halibut Convention of 1953), or Continental Shelf Fishery Resources. These restrictions are imposed to prevent covert targeting on species of special importance to U.S. fishermen.*

(b) No fishing within 12 miles of the baseline used to measure the Territorial Sea except in the western Aleutian Islands as described in Section 2.4.1.2.2. These restrictions are imposed to prevent catch of localized inshore species important to U.S. fishermen and natives.*

(c) All restrictions on the trawl fishery for sablefish as in the Final Environmental Statement/Preliminary Management Plan of the Trawl Fishery of the Bering Sea and Aleutian Islands and the Trawl Fishery of the Gulf of Alaska.

(d) The sablefish fishery in each region is to be terminated when the quota or effort limitation for that region is reached.

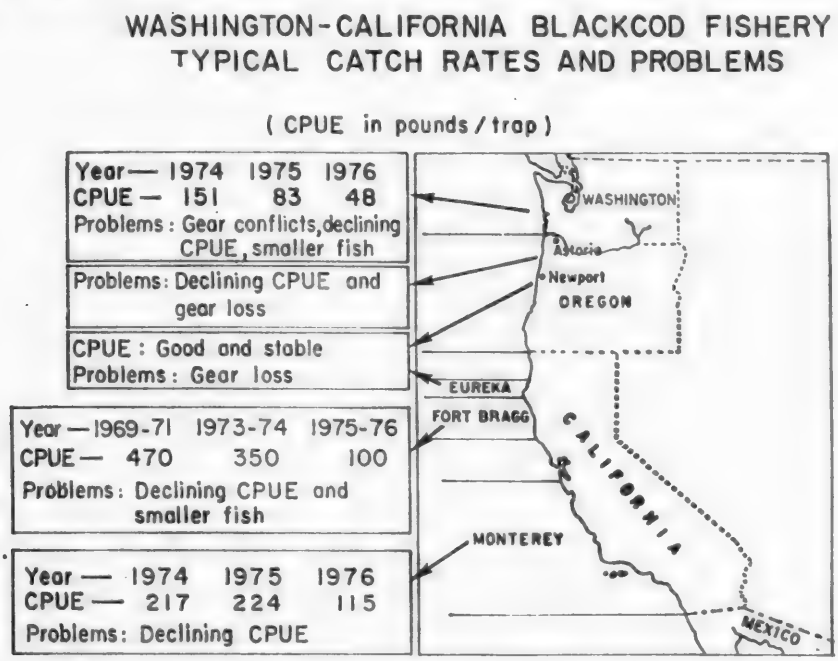


Figure 20.—Typical catch rates and problems encountered by the United States sablefish fishery in recent years off Washington-California. (Prepared from correspondences noted in footnote 6.)

Specific management measures for foreign sablefish fisheries are devised in terms of catch quotas, area-time closures, and vessel-gear limitations by geographical areas. These measures are summarized in Figure 21.

(1.) *Bering Sea.* a. *Catch Limitations.*—Based upon status of stock analyses and recent year catch trends, the total catch will be limited to 5,000 metric tons per year. This limitation is necessary because indices of abundance of sablefish are extremely low in the Bering Sea and it would allow the sablefish resource to improve from its present deteriorated state. The U.S. does not have a fishery for sablefish in the Bering Sea and, therefore, all of this 5,000 metric tons are surplus fish available for foreign fisheries.

b. *Area-Time Closures.*—No area-time closures are considered necessary to protect the biological status of sablefish in the Bering Sea.

c. *Vessel-Gear Limitation.*—For the Bering Sea area within U.S. 200-mile jurisdiction and outside the current 12-mile fishery zone, a limit of 750 vessel-days by foreign longline/trap vessels should be permitted to fish for sablefish in order to continue the Bering Sea longline data base for stock appraisals. Assuming a catch of 3 metric tons per vessel-day, this effort is expected to catch 2,250 metric tons per year. The remaining catch of 2,750 metric tons is expected to be taken by trawl gear—mostly as incidental by-catches of the pollock fishery. However, distinction of catch by gear-type is not necessary at this time from a conservation point of view.

*Identical to current bilateral arrangements.

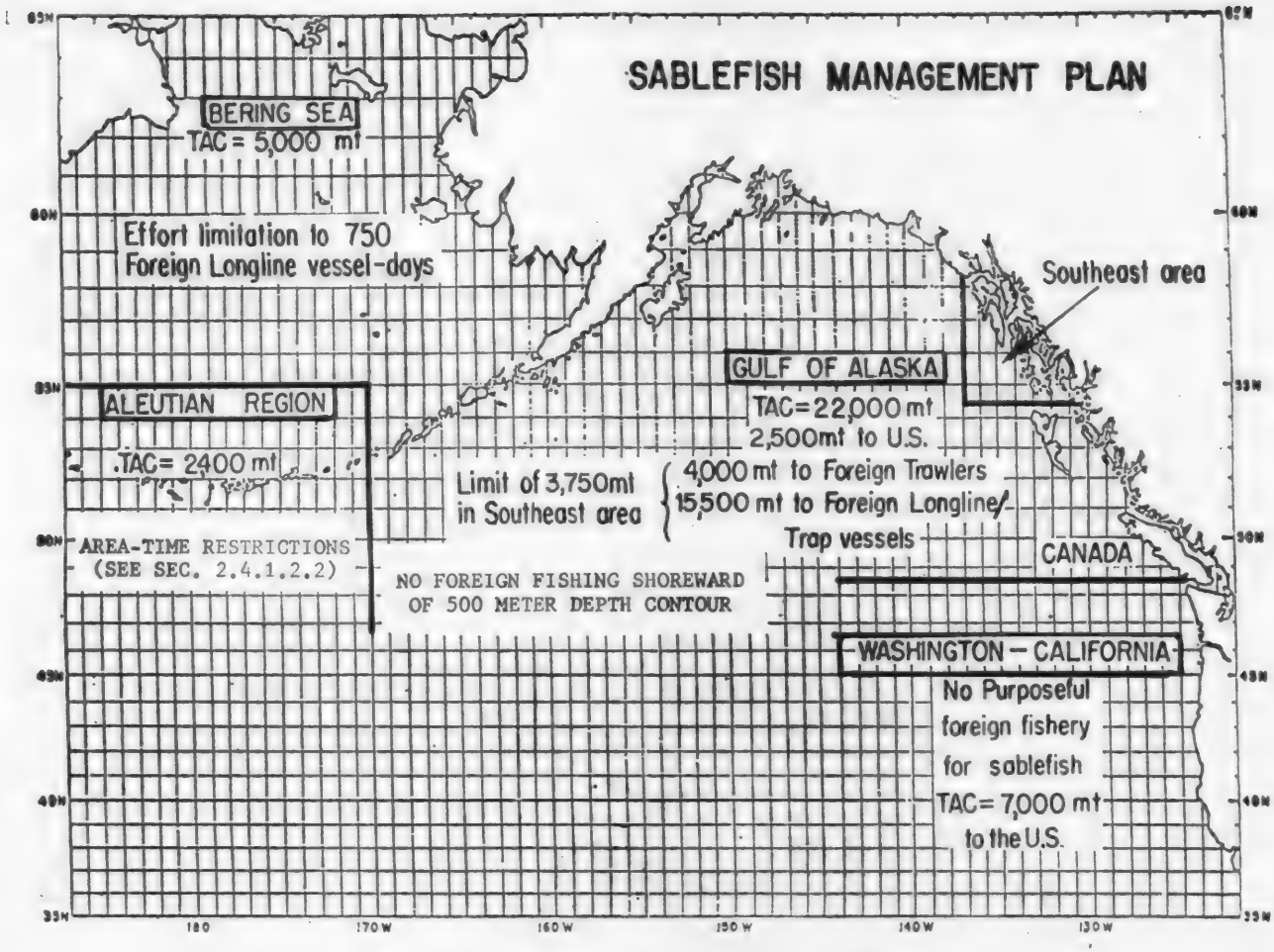


Figure 21.-- Summary of preliminary Fisheries Management Plan for Sablefish, 1977.

(2) *Aleutian Region.* a. *Catch Limitations.*—Based upon status of stock analyses and recent year catch trends, the total catch will be limited to 2,400 metric tons per year.

Since the U.S. does not have a fishery for sablefish in the Aleutian Region, all of this 2,400 metric tons are surplus fish available for foreign fisheries.

b. *Area-Time Closures.*—Consistent with present bilateral arrangements, areas and times in the Aleutian Region where foreign fishing is permitted up to the Territorial Sea are:

A. In the waters off the Bering Sea coast of the Aleutian Islands:

(1) between 169° and 170° West longitude, dragnet fishing from May 16 to November 30 inclusive, and longline fishing year-around;

(2) between 170° and 172° West longitude, dragnet and longline fishing year-round;

(3) between 172° and 176° West longitude, longline fishing from April 1 to October 31 inclusive;

(4) west of 176° West longitude, dragnet fishing from May 1 to December 31 inclusive and longline fishing year-round.

B. In the waters off the Pacific coast of the Aleutian Islands:

(1) between 169° and 172° West longitude, dragnet and longline fishing year-round;

(2) between 172° and 178°30′ West longitude, longline fishing from April 1 to October 31 inclusive;

(3) between 176° and 178°30′ West longitude, dragnet fishing from July 1 to October 31 inclusive;

(4) west of 178°30′ West longitude, dragnet fishing from May 1 to December 31 inclusive and longline fishing year-round.

(3) *Gulf of Alaska.* (East of 170° W. and north of 54°30′ N.—Shumagin to Southeast).

Catch Limitations. Based upon status of stock analyses and recent year catch trends, the total catch will be limited to 22,000 metric tons in 1977. This limitation is necessary to arrest declining stock abundance and to improve stock conditions.

The U.S. sablefish fishery, as projected by the fishing industry, is capable of harvesting 2,500 metric tons in 1977 in the Gulf of Alaska region. Accordingly, the surplus available for foreign fishing will be limited to 19,500 metric tons for 1977. Of this total, 4,000 metric tons are expected to be taken by trawl gear. The remaining 15,500 metric tons could then be taken by the foreign longline/trap fisheries. The U.S. sablefish fishery is expanding rapidly off southeastern Alaska and due to socio-economic considerations, no more than 3,750 metric tons of the surplus fish available for foreign fisheries should be taken in the INPFC Southeastern Statistical Area.

b. *Area-Time Closures.*—To reduce gear conflicts between U.S. and foreign fishermen, the foreign fishery will be conducted seaward of the 500 m depth contour. As a Japanese domestic regulation currently requires their fishery to operate at depth greater than 500 meters, this should not be a handicap to foreign access to the resource.

c. *Vessel-Gear Limitations.* As noted in the Catch Limitations section, the surplus for foreign fisheries will be reduced to 4,000 metric tons for trawls and 15,500 metric tons for longline/trap vessels. The number of longline vessel-

days to be permitted in the sablefish fishery to achieve this catch is:

1. Japanese longliners: allocated catch divided by 5.5 mt per vessel day;
2. Republic of Korea longline/trap vessels: allocated catch divided by 3.5 mt per vessel-day; and
3. Republic of China longliners specifically fishing for sablefish: allocated catch divided by 2 mt per vessel-day.

(4) *Washington-California.* a. *Catch Limitations.*—The total allowable catch for sablefish off the Washington-California coast is 7,000 metric tons for 1977. In 1974, the U.S. catch in the region was at least 6,100 metric tons and the U.S. fishery has the potential to harvest all of the 7,000 metric tons total allowable catch. Therefore, there should be no surplus for foreign fisheries.

b. *Relation of Regulatory Measures to National Standards.* The TAC limits and other regulatory measures have been proposed after taking into consideration the seven national standards defined by Public Law 94-265 (Table 6). Itemized standards (1 to 7) have been abbreviated in the table and pertain to the sablefish management plan as follows:

Table 6.--Relationship of sablefish management measures to national standards.

National Standards According to Pub. Law 94-265, Title III, 16USC 1851. Sec. 301. (2)	Management Measures					
	Bering Sea		Aleutian	Gulf of Alaska		Washington-California
	TAC	Vessel Limitation	TAC	Trawl TAC	Longline TAC	Closed to foreign fisheries
(1) Prevent overfishing	X	X	X	X	X	X
(2) Based upon scientific information	X	X	X	X	X	X
(3) Management by unit stock	X	X	X	X	X	X
(4) Non-discriminatory allocation to different States in the U.S.	—	—	—	—	—	—
(5) Promote efficiency in utilization of resource	X	X	X	X	X	X
(6) Allowance for variations in fisheries, resources, and catches	X	X	X	X	X	X
(7) Minimize costs and avoid duplication	X	X	X	X	X	X

Notation: A dash (--) designates that national stardard factor does not apply and a cross (X) designates that the standard applies.

(1) Regulatory measures proposed for foreign fisheries are designed to prevent overfishing and achieve optimum yield from catch of the stocks.

(2) These regulatory decisions are based upon the best scientific information available.

(3) The regulatory measures have taken into consideration the relationship of stock units throughout the range of sablefish in the North Pacific.

(4) The non-discriminatory allocation of sablefish to different States in the U.S. does not apply because no allocation is necessary at this time.

(5) The restrictions on trawl caught fish and the effort to make the sablefish fishery into a longline/trap operation are recommended to reduce sub-optimal sized fish from being taken in the fishery. The condition and price of longline/trap caught fish are better than those landed by trawls.

(6) Limitations on TAC have been set after assuming that there will be no drastic changes to the sablefish stocks. The limitation of 15,500 mt in the Gulf of Alaska for non-trawl caught fish would mean a drastic reduction in longline effort. About 2,800 vessel-days by vessels fishing as efficiently as Japanese longliners could achieve the TAC.

(7) The cost of enforcing catch limits may be reduced if the number of fishing days and typical catch rates by foreign vessels are known.

C. *Foreign Contributions to Sablefish Management.* Each nation whose fishermen operate in the U.S. 200-mile fishery zone is required to have permits issued by the Secretary of Commerce for its vessels, adhere to established regulations, and to cooperate with the U.S. in managing the fisheries resource. They are required to collect detailed and accurate fishery data pertinent for scientific evaluations of the resource and the fishery. They are also required to permit U.S. observers aboard their commercial vessels to conduct research and monitor catches. Details of these requirements are described in the following sections.

(1) *Fishery Data.* a. Each nation shall provide (to the Regional NMFS Director) by May 30 of the following year annual catch and effort statistics, as follows: Effort in hours trawled, number of longline units, number of traps, duration of soaking time for longlines and traps, and number of days fishing, by vessel class, by gear type, by month, by ½° (Lat.) x 1° (Long.) statistical area; Catch in metric tons, by vessel class, by gear type, by month, by ½° (Lat.) x 1° (Long.) statistical area. The characteristic features of gear and vessels are also to be reported.

b. In addition to the annual statistical report in a., above, each nation shall provide (to the Regional NMFS Director) by the end of the following month, provisional monthly fishery information as follows: Catch in metric tons and Effort in vessel-days by vessel type and by INPFC large statistical areas—Bering Sea (Subarea 1, 2, 3, and 4), Aleutian Region, Shumagin, Chirikof, Kodiak, Yakutat, Southeast, and other designated areas. It will also be desirable to obtain data off Canada (Charlotte and Vancouver) in order to have a complete evaluation of the entire sablefish resource whose stocks appear to be interrelated.

(2) *Fleet Disposition Information.* The appropriate fleet commander or individual vessel master shall report (to the Regional NMFS Director) by radio prior to the commencement of fishing, the arrival in the Region of each fishing and fishery support vessel, giving the vessel's name, other identifying marks, intended target species, and INPFC statistical areas. A similar report (to the Regional NMFS Director) will be made at the time of departure or shift to new statistical

area of each vessel in the Region. These reports, augmented with U.S. surveillance observations and monthly catch and effort reports, shall be used to pace the fishery and monitor adherence to catch and effort limitations.

(3) *Biological Statistics.* Biological sampling of sablefish catches shall be made by foreign nations according to procedures developed and coordinated through consultations between U.S. and foreign scientists so as to determine the representative size, age, and weight of individual fish in the catch.

(4) *Observers.* All vessels of each nation operating in the Region will have available at no cost to the U.S. accommodation for at least one U.S. observer. Observers will be assigned to individual vessels and for periods at the discretion of the U.S. to measure daily catch rates; estimate species, size, weight, and age compositions; collect other biological data as appropriate; determine location and duration of fishing effort; and, obtain gear dimensions and observe performance fishing operations.

(5) *Research.* Bona fide fishery or fishery-related research (but not exploratory fishing) by foreign governments will be encouraged. Valid results of such research will be considered by the management entity in determining total allowable catches and other management measures. Cooperative U.S.-foreign research ventures will be planned and executed when they are found to be in the best interest of the U.S.

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7. FOOTNOTES

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APPENDICES

Appendix 1.--Sablefish catch per unit effort data by Japanese longliners by area[1/] in the Bering Sea, 1964-74.

	Area 1	Area 2	Area 3	Area 4	Total
(A) Catch in metric tons					
1964	334	945	702	472	2453
1965	188	88	503	285	1064
1966	952	730	472	136	2290
1967	386	1271	194	13	1864
1968	115	133	64	0	312
1969	251	311	29	0	591
1970	640	616	22	0	1278
1971	663	615	0	0	1278
1972	234	213	0	0	447
1973	240	206	0	0	446
1974	644	194	0	0	838
(B) Effort in 10 hachi longline units					
1964	5197	14005	11519	9508	40229
1965	1032	957	8026	9589	19604
1966	2853	3211	5635	4800	16499
1967	1812	5897	1033	151	8893
1968	460	1075	647	0	2182
1969	1153	1755	223	0	3131
1970	2741	2536	265	0	5542
1971	3542	6373	728	0	10643
1972	1943	6099	950	0	8992
1973	1805	6678	525	473	9481
1974	3993	1756	0	0	5749
(C) CPUE in kilograms per 10 hachi longline units					
1964	64.3	67.5	60.9	49.6	61.0
1965	182.2	92.0	62.7	29.7	54.3
1966	333.7	227.3	83.8	28.3	138.8
1967	213.0	215.5	187.8	86.1	209.6
1968	250.0	123.7	98.9	-	143.0
1969	217.7	177.2	130.0	-	188.8
1970	233.5	242.9	83.0	-	230.6
1971	187.2	96.5	-	-	120.1
1972	120.4	34.9	-	-	49.7
1973	133.0	30.8	-	-	47.0
1974	161.3	110.5	-	-	145.8

1/ Areas defined in Figure 5.

Appendix 2.--Sablefish catch per unit effort data of Japanese landbased stern trawlers by area[1/] in the Bering Sea, 1967-74

	Area 2	Area 3	Area 4	Total
(A) Catch in metric tons				
1967	2362	1090	229	3681
1968	4873	2760	98	7731
1969	6478	2074	380	8932
1970	3087	1037	158	4282
1971	6593	821	330	7744
1972	5687	1647	170	7504
1973	2390	789	63	3242
1974	2103	489	41	2633
(B) Effort in hours trawled				
1967	14706	6257	3465	24428
1968	30101	23961	3619	57681
1969	38363	19698	4996	63057
1970	48571	32104	4623	85298
1971	60026	30779	10923	101718
1972	63037	52206	5399	120642
1973	35925	38052	4508	78485
1974	62079	38781	9031	109891
(C) Effort in days fishing				
1967	1451	608	345	2093
1968	3076	2350	433	5859
1969	3352	1659	573	5584
1970	3591	2375	355	6321
1971	4591	2194	760	7545
1972	4528	3632	391	8551
1973	2585	2810	374	5769
1974	4252	2887	759	7898
(D) CPUE in kg per hour trawled				
1967	160.6	174.2	66.1	150.7
1968	161.9	115.2	27.1	134.0
1969	168.9	105.3	76.1	141.6
1970	63.6	32.3	34.2	50.2
1971	109.8	26.7	30.2	76.1
1972	90.2	31.5	31.5	62.2
1973	66.5	20.7	14.0	41.3
1974	33.9	12.6	4.5	24.0
(E) CPUE in kg per boat-day fishing				
1967	1628	1793	536	1759
1968	1584	1175	172	1320
1969	1933	1250	451	1600
1970	860	437	300	677
1971	1436	374	310	1026
1972	1256	454	241	878
1973	925	281	107	562
1974	495	169	94	333

1/ Areas are defined in Figure 5; the land-based dragnet fishery is restricted from operating in Area 1.

Appendix 3.--Sablefish catch per unit effort data by Japanese longliners and land-based stern trawlers in the Aleutian Region, 1964-74.

(A) Longliners

Year	Catch in metric tons	Effort in 10 hachi units	CPUE in kg per 10 hachi units
1964	909	6550	138.8
1965	222	2016	110.1
1966	1128	4931	228.8
1967	785	2830	277.4
1968	451	2728	165.3
1969	323	1752	184.4
1970	626	3320	188.6
1971	535	3245	164.9
1972	496	2449	202.5
1973	845	4412	191.5
1974	955	4954	192.8

(B) Stern trawlers

Year	Catch in metric tons	Effort in hours	Effort in days	CPUE in kg per hour	CPUE in kg per day
1967	245	1589	218	154.2	1124
1968	882	3412	372	258.5	2371
1969	1272	4005	415	317.6	3065
1970	565	5056	578	111.8	978
1971	1514	6822	729	221.9	2077
1972	2188	17727	1482	123.4	1476
1973	1477	12899	1100	114.5	1343
1974	1018	22896	2219	44.5	459

Appendix 4.--Computation of sablefish catch per boat day by Japanese longliners in the Aleutian Region and the Gulf of Alaska.

	Aleutian Region			Gulf of Alaska[1/]		
Year	Catch[2/]	Boat-days[3/]	CPUE[4/]	Catch[2/]	Boat-days[3/]	CPUE[4/]
1971	535	126	4,250	23,064	1,939	11,890
1972	496	42	11,810	29,598	2,744	10,790
1973	845	126	6,710	23,202	2,730	8,500
1974	955	224	4,260	18,710	3,171	5,900
1975[5/]	775	357	2,170	8,800	1,617	5,440

1/ Shumagin, Chirikof, Kodiak, Yakutat, southeastern Alaska.
2/ Japanese longline catch in metric tons reported to INPFC.
3/ Surveillance estimates by NMFS taking into consideration number of boats sighted in over-flight and boat-stay on the fishing grounds.
4/ Kilograms per boat day.
5/ January through July, preliminary catch data from INPFC Document 1805.

Appendix 5.--Sablefish catch per unit effort data by Japanese longliners by area[1/] in the northeastern Pacific Ocean, 1968-74.

Year	Area 6 Western Gulf	Area 7 Northwestern Gulf	Area 8 Northeastern Gulf	Area 9 Southeastern Charlotte	Area 10 Vancouver-Columbia	Total
(A) Catch in metric tons						
1968	39	715	3141	6619	277	10791
1969	387	3034	5317	9601	1996	20335
1970	857	5900	6942	10664	1088	25451
1971	1515	5397	6288	9864	594	23658
1972	2997	7647	6982	11972	838	30436
1973	3204	6714	5448	7736	798	23900
1974	2833	4592	4128	7157	1203	19913
(B) Effort in 10 hachi longline units						
1968	246	3834	12306	25587	1305	43278
1969	1863	12805	22444	42696	10192	90000
1970	3961	22621	27159	47666	5043	106450
1971	8606	26155	28179	50602	4152	117694
1972	13575	37030	33988	57631	4124	146348
1973	15056	31123	26366	38072	3622	114239
1974	14984	24025	21545	36685	5470	102709
(C) CPUE in kg per 10 hachi longline unit						
1968	158.5	186.5	255.2	258.7	212.3	249.3
1969	207.7	236.9	236.9	224.9	195.8	225.9
1970	216.4	260.8	255.6	223.7	215.7	239.1
1971	176.0	206.3	223.1	194.9	143.1	201.0
1972	220.8	206.5	205.4	207.7	203.2	208.0
1973	212.8	215.7	206.6	203.2	220.3	209.2
1974	189.1	191.1	191.6	195.1	219.9	193.9

1/ Areas defined in Figure 5.

Appendix 6.--Catch, effort, and catch per unit effort of sablefish by U.S. trawlers in area 11 (Eureka-Monterey), 1963-74.

Year	Catch[1/] in metric tons	Effort in hours trawling	CPUE in kg per hour
1963	893	59,247	15.1
1964	1,023	53,941	19.0
1965	1,344	60,045	22.4
1966	1,406	55,323	25.4
1967	993	51,662	19.2
1968	1,003	51,267	19.6
1969	1,393	53,166	26.2
1970	1,330	56,103	23.7
1971	1,435	57,451	25.0
1972	2,342	73,466	31.9
1973	3,235	81,472	39.7
1974	2,514	70,603	35.6

Data sources: PMFC data series, 1964-74.

1/ Data include sablefish for animal food and by calendar years.

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